



# **Filer City Biomass Carbon Removal and Storage (BiCRS) Net-Negative Study**

Project Number: DE-FE0032262

Tim Gehring  
NorthStar Clean Energy

---

2024 Carbon Management Research Project Review Meeting  
August 5 – August 9, 2024

# Project Overview

---

## – Funding

- DOE: \$1,416,224
- Cost Share: \$903,913

## – Overall Project Performance Dates

- Award Date – 08/01/2023
- DOE Kick-off Meeting – 9/19/2023
- Basis of Design for Project Finalized – 11/02/2023
- Preliminary Process Design Review – 12/22/2023
- Initial Engineering Design Package – 12/22/2023
- Overall Cost Estimate and Cost of Capture Review – 04/01/2024
- Final Engineering Design Package – 05/15/2024
- Final DOE Report and Presentation – 10/08/2024
- Grant Closing Date – 10/31/2024

# Project Overview

---

- Project Participants
  - DOE/NETL - Sponsor
  - NorthStar Clean Energy – Prime
  - Babcock & Wilcox – Bio-Energy Carbon Capture and Support Services
  - Sargent & Lundy – EPC Engineering and Support Services
  - GTI – Community Benefits Planning
- Overall Project Objectives
  - Confirm availability of sustainably sourced biomass – **Achieved** – 20+ years – completed January 2023.
  - Confirmed existing boilers can be retrofitted to fire 100% woody biomass - **Achieved**

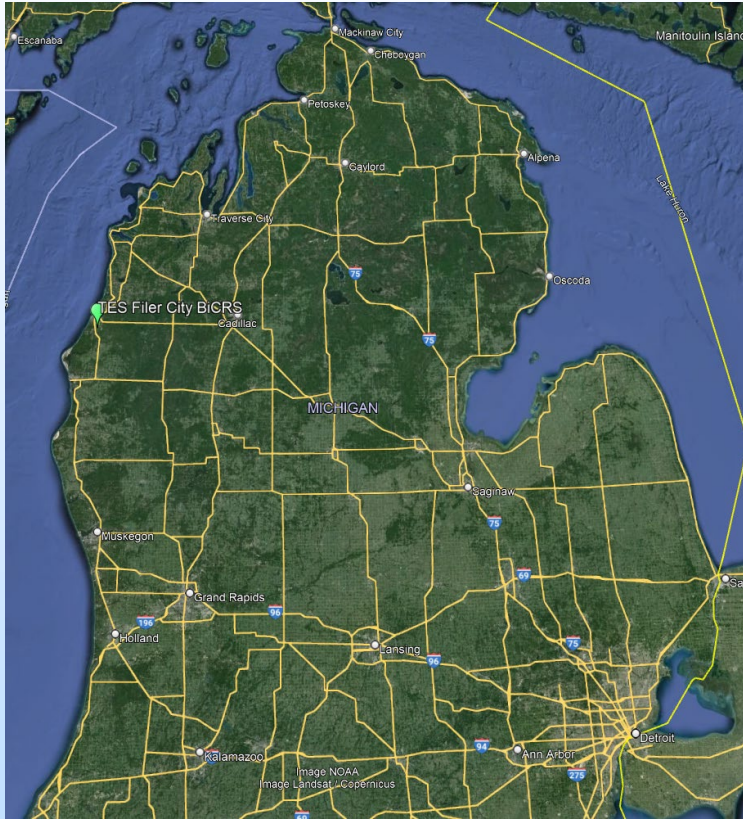
# Project Overview

---

## – Overall Project Objectives

- 95% CO<sub>2</sub> removal from flue gas at design conditions – **Achieved** - Capture design ~ 500,000 metric tons of CO<sub>2</sub>/year
- Determine net power supply to the grid – **Achieved** - 25 MWs of base load 24/7 carbon-free electricity and process steam
- Prove viability of business case - AACE Class 4 estimate – **Possible**
- Create a Community Benefits Plans – **Achieved** – Final review scheduled – 8/19/2024
- Goal at start of study was to begin construction in 2025 – Current construction start - schedule early 2026
- Goal at start of study - COD in 2026 – Current schedule end of 2028

# Project Background



# Project Background

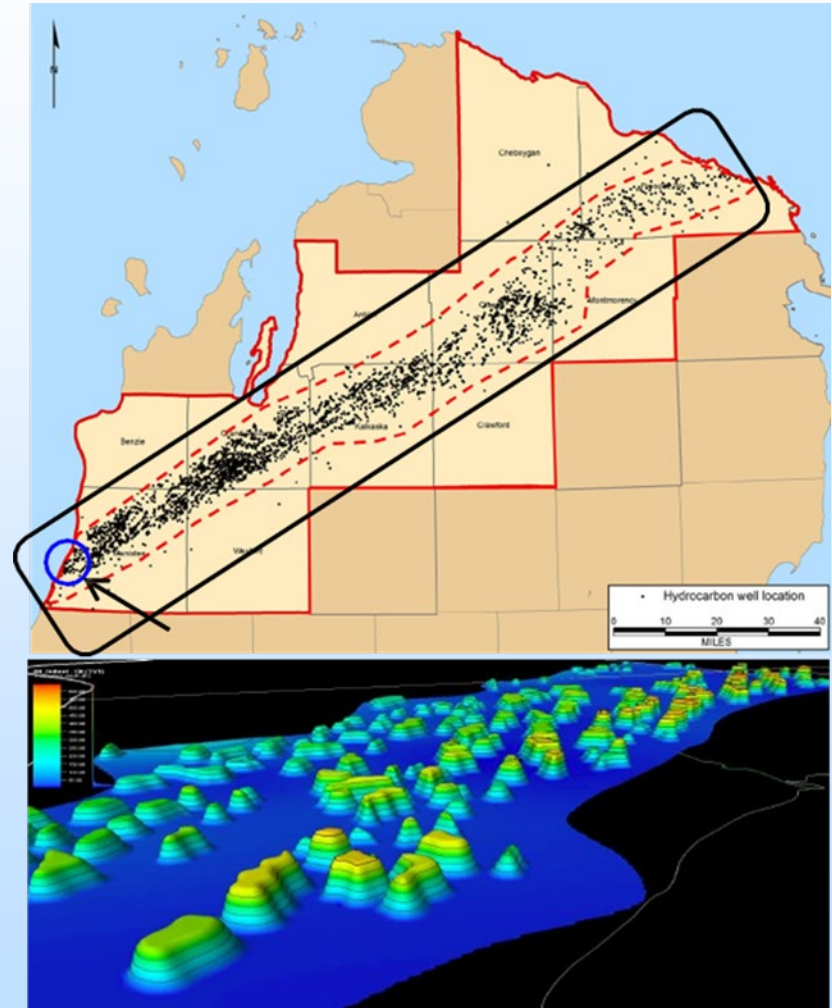
- The Project reached commercial operations in 1990 – 73 MW gross output- A partnership between Tondu Corp/CMS Enterprises (now NorthStar Clean Energy)
- Corporate commitment to stop burning coal in 2025
- Project is located on Manistee Lake with access to Lake Michigan
- A Michigan State University study concluded that there are over 61 million tons/year of unutilized sustainable biomass within trucking distance of the Filer Plant and more than 100 million tons/year from Michigan's upper peninsula via Great Lake's shipping.





# Technical Approach

- Project is located less than ½ mile from existing pipeline infrastructure for transport of CO<sub>2</sub> to the highly studied Niagaran Reef trend.
- There are over 140 reefs with the potential to store between 500,000 and 2,000,000 metric tons of CO<sub>2</sub> each.
- Strong relationship with Core Energy: Who has CO<sub>2</sub> Monitoring, Reporting, and Verification (MRV) Plan approved Environmental Protection Agency (EPA) covering the entire Reef Trend.



# Technical Approach

---

- Optimize current power block to burn 100% biomass.
- Prior to carbon capture the exhaust gas from the repowered existing boilers gas will route through:
  - Selective non-catalytic reduction (new)
  - Dust collectors (existing)
  - Spray dryer absorbers (existing)
  - Baghouse (existing)



# Technical Approach

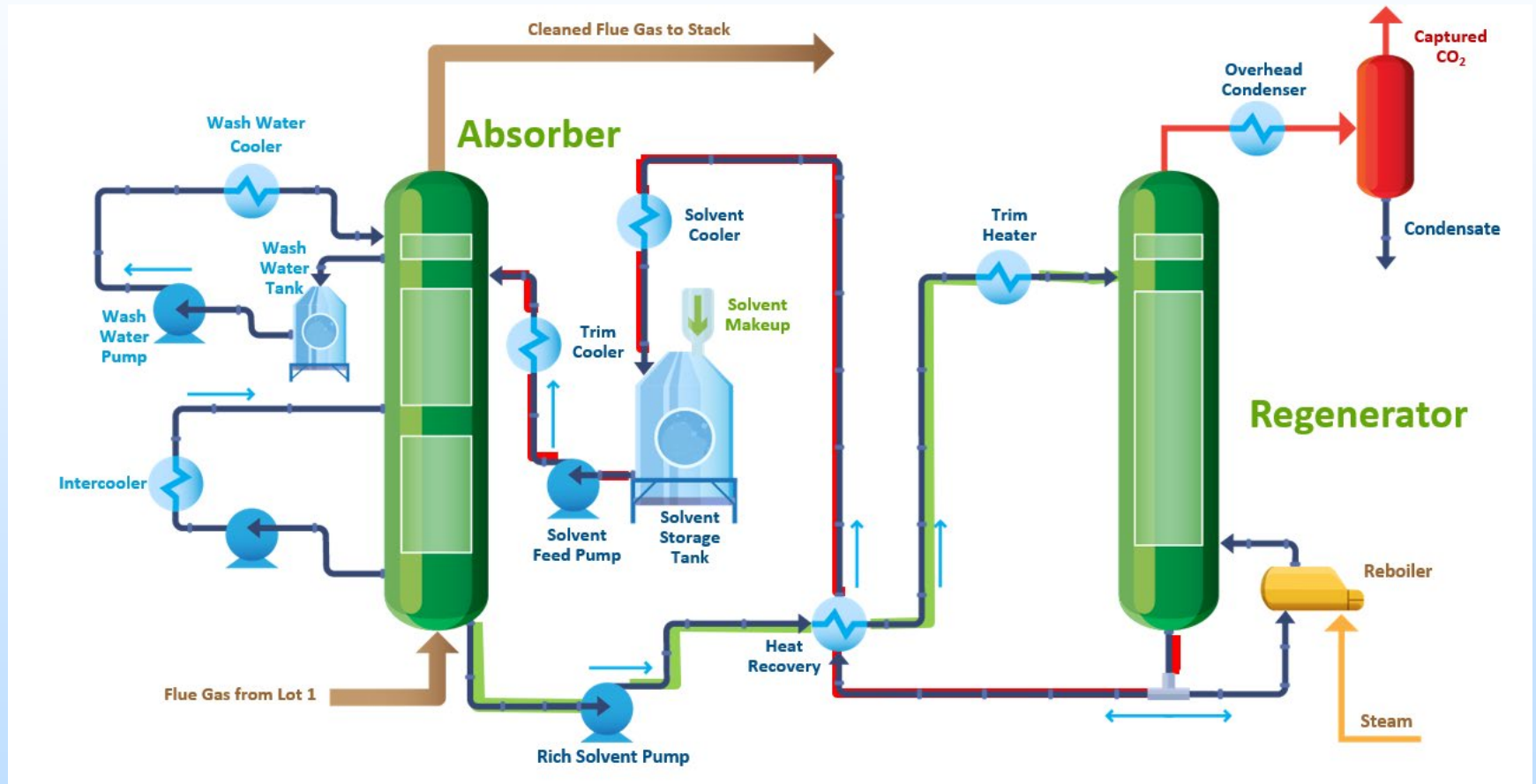
---

## Babcock & Wilcox - CO<sub>2</sub> Capture System

- Amine-Based Solvent Scrubbing Process – solvent agnostic – MEA/DGA/Proprietary Solvents can be used.
- Technology Readiness Level (TRL): 8 - technology has been tested and qualified through demonstration and is ready for commercialization
- The two major pieces of equipment:
  - Absorber: contacts solvent with incoming flue gas to absorb CO<sub>2</sub> into solution
  - Regenerator: CO<sub>2</sub> rich solvent from absorber routed to regenerator where heat is added to strip the CO<sub>2</sub> from the solvent.

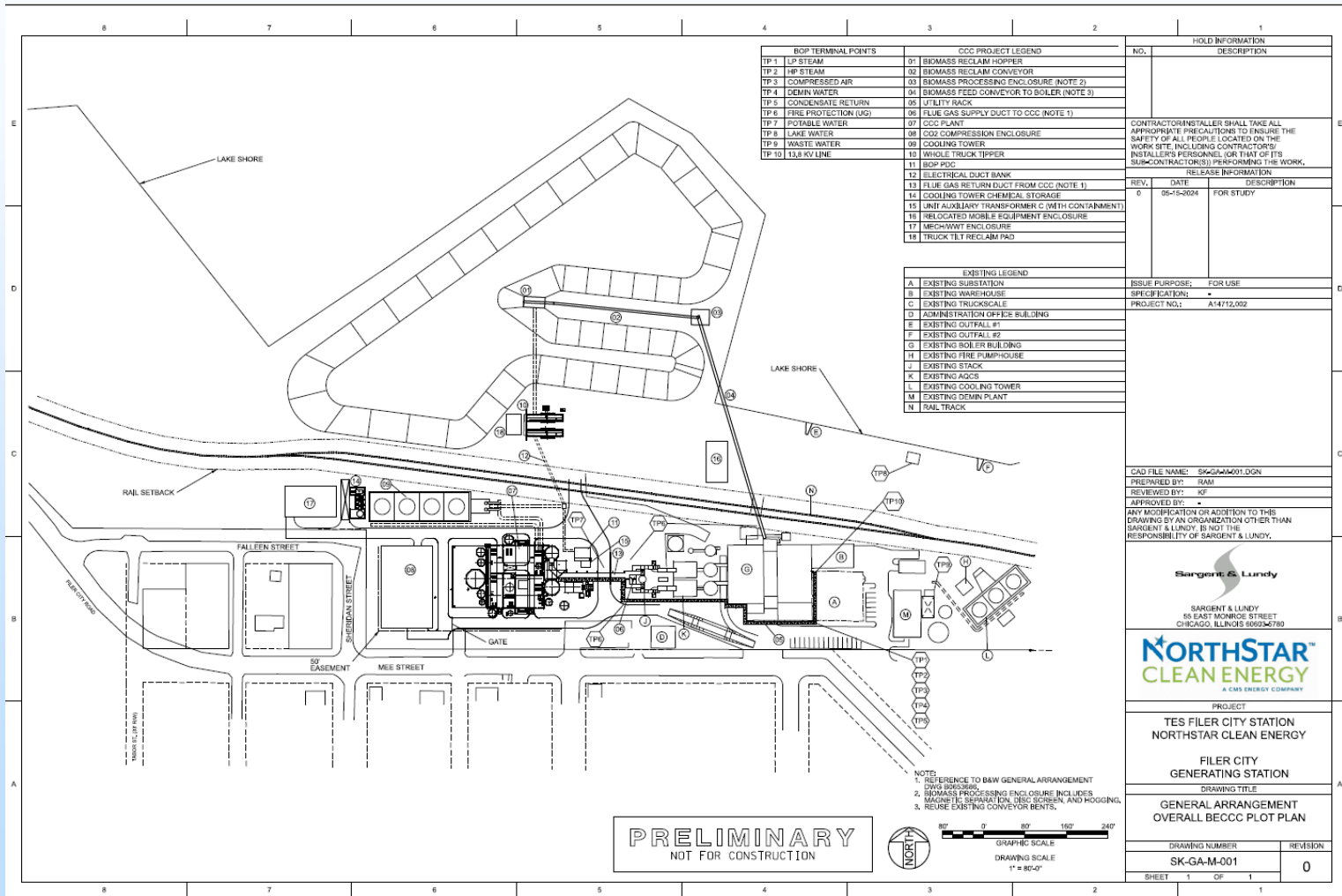
# Technical Approach

## Amine-Based Solvent Scrubbing Process



# Technical Approach

## General Arrangement



# Summary of Community Benefits Planning



**CSE** - Development of inclusive two-way engagement strategies leveraging existing infrastructures to facilitate meaningful community input from local stakeholders that include disadvantaged, underrepresented groups



**J40** - Outlined a process to assess benefits and potential impacts on J40 metrics for BiCRS and developed strategies to deliver benefits to local, disadvantaged, hard-to-reach, and tribal communities



**QJ** - Promoting equitable workforce development, quality jobs, and planning for partnerships to advance knowledge on BiCRS



**DEIA** - Established commitments to advance DEIA in the project and increase benefits with members of DACs

## Notable Community Stakeholder Engagement Activities During Grant Period

- Engagement activities with local governments is ongoing. Met with the Filer City Charter Township supervisors.
- Letter of support for the project received from the Little River Band of Ottawa Indians and Boilermakers Union.

# Lessons Learned

---

- Sale of Carbon Dioxide Removal (CDR) Credits critical for project economics.
- CO<sub>2</sub> use for enhanced oil recovery not a viable option for our project
- Project size/uniqueness creates challenges for economics and execution
- Community benefits planning for an existing plant vs greenfield is very different
- Community benefit plans take time and effort but are very important

# Next Steps

---

- Class VI well permitting
- Continue marketing CDR credits
- Validate cost and performance of multiple CC technologies
- Purchase of long lead items (transformer)
- CDR credit certification process
- DOE LPO Financing/other funding opportunities – submitted  
Draft Part 1 for review
- Air Permit Modification
- Water Permit Modification (as needed)



# Summary Slide

---

In Summary - based on the results of the Pre-FEED study:

- Project it is economically viable with 45Q tax benefits, federal financing, along with the sale of carbon dioxide removal credits
- A 95% CO<sub>2</sub> capture rate is achievable.
- The plant will produce 25 MW of carbon free power.
- The overall process of biomass firing with CO<sub>2</sub> Capture at Filer City results in emissions of -3164.8 kg CO<sub>2</sub>e per delivered MWh.
- There is an ample supply of sustainably sourced biomass to fuel the facility.
- The plant will capture approximately 500,000 metric tons of atmospheric CO<sub>2</sub> per year.
- Community benefits plans have been created and stakeholder engagement continues.
- Over the first 12 years of commercial operation over \$1.2 billion dollars of positive economic impact will accrue to Michigan supporting 220 permanent jobs in the Northern Michigan economy.

# Acknowledgements

- Tondu Corp
- Babcock & Wilcox
- Sargent & Lundy
- Filer City Plant Staff
- NorthStar Staff