Project Overview : DE-FE0031590

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

Description: Testing and evaluation of transformational non-aqueous solvent (NAS)-based CO_2 capture technology at engineering scale at TCM

Key Objectives:

- Solvent energy requirements and capture efficiency
- Solvent degradation, corrosion, emissions
- Technoeconomic evaluation

Specific Challenges

- New unit technical and process risks
- Operate TCM plant within emission requirements
- Minimize rise in absorber temperature
- Maximize NAS performance with TCM plant configuration

Timeframe: 8/8/18 to 03/31/24

Total Funding: $17,584,062

Participants:

CO2 Technology Centre Mongstad; EPRI Electric Power Research Institute; CCSI² Carbon Capture Simulation for Industry Impact; RTI International; Pressura; SINTEF; Texas, The University of Texas at Austin; University of Oslo; NexantECA

RTI NAS CO_2 Capture Technology Development History

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RTI Lab-Scale Development & Evaluation (2010-2013)

Solvent screening and lab-scale evaluation

~$2.7MM

TRL 1-3

RTI Large Bench-Scale System (2014-2016)

Demonstration of key process features (≤ 2,000 kJ/kg CO_2) at bench scale

~$3 MM
6kW

~0.1 t-CO_2/day

TRL 3-4

SINTEF Pilot Testing at Tiller Plant (2015-2018)

Demonstration of all process components at pilot scale with real flue gas

~$3MM
60 kW

~1.0 t-CO_2/day

TRL 4-5

NCCC Pilot Testing at SSTU (2018)

Degradation, emission, and corrosion characterizations with real flue gas

~$0.75MM
50 kW

~1.0 t-CO_2/day

TRL 4-5

RTI Emissions control (2018-2021)

Effective emissions mitigation strategy for NAS at engineering-scale

~$3.5MM
6kW

~0.1 t-CO_2/day

TRL 3-4

TCM Engineering-Scale Validation (2018-2023)

Pre-commercial demonstration at Technology Centre Mongstad, Norway

~$17.4 MM
12 MW

~200 t-CO_2/day

TRL 5-6

From lab to large scale demonstration through series of projects

DOE Performance Goal

New coal-fired power plants with CO_2 capture at a cost of electricity 30% lower than the baseline cost of electricity from a supercritical PC plant with CO_2 capture, or approximately $30 per tonne of CO_2 captured by 2030.

Breakdown of the Thermal Regeneration Energy Load

$$q_R = \left[\frac{C_P(T_R - T_F)}{\Delta\alpha} \cdot \frac{M_{sol}}{M_{CO_2}} \cdot \frac{1}{x_{sol}}\right] + \left[\Delta H_{V,H_2O} \cdot \frac{p_{H_2O}}{p_{CO_2}} \cdot \frac{1}{M_{CO_2}}\right] + \left[\frac{\Delta H_{abs,CO_2}}{M_{CO_2}}\right]$$

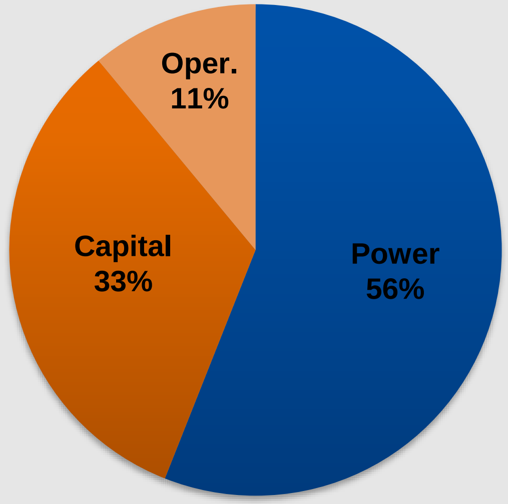
Reboiler Heat Duty — Sensible Heat — Heat of Vaporization — Heat of Absorption

Solvent	C_p [J/g K]	ΔH_{abs} [kJ/mol]	ΔH_{vap} [kJ/mol]	x_{solv} [mol solvent/mol solution]	$\Delta\alpha$ [mol CO_2/ mol solvent]	Reboiler Heat Duty [GJ/t-CO_2]
30 wt% MEA-H_2O	3.8	85	40	0.11	0.34	3.75
RTI's NASs	2.0	85	negl.	0.47	0.45	2.40

Heat of vaporization of water becomes a negligible term to the heat duty

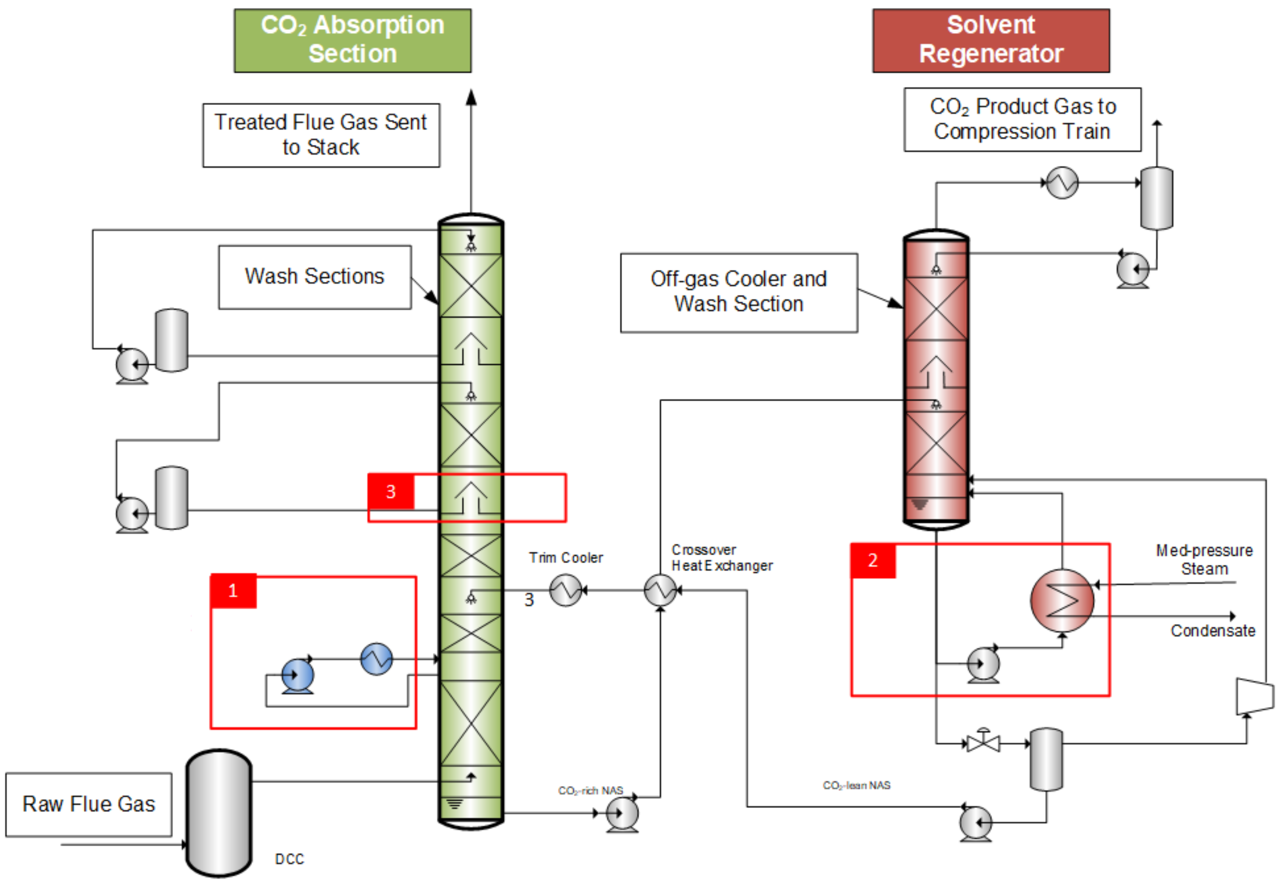
Path to Reducing lCOE and Cost of CO_2 Avoided

- Primarily focused on reducing energy consumption – reboiler duty
- Reduce capital expenditure
  - Simplify process arrangement
  - Materials of construction
- Limit operating cost increase



[1] Rochelle, G. T. Amine Scrubbing for CO_2 Capture. *Science* **2009,** 325, 1652-1654.

BP1 TCM Amine Plant and NAS Modifications



TCM

- Amine plant modifications
- Leadership in detailed engineering, fabrication, and construction
- Process modeling expertise
- Excellence in operations

Absorber Modifications

- One interstage cooler
- Equipment within budget
- Control temperature bulge at top to decrease emissions

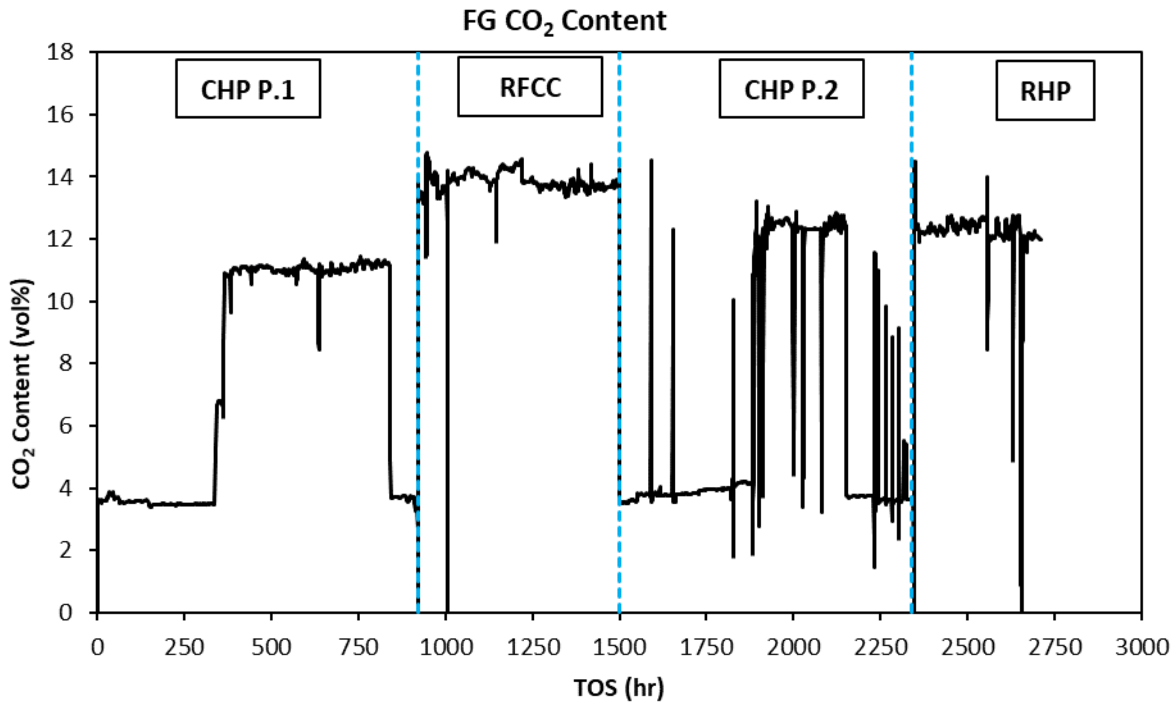
Regenerator Mods

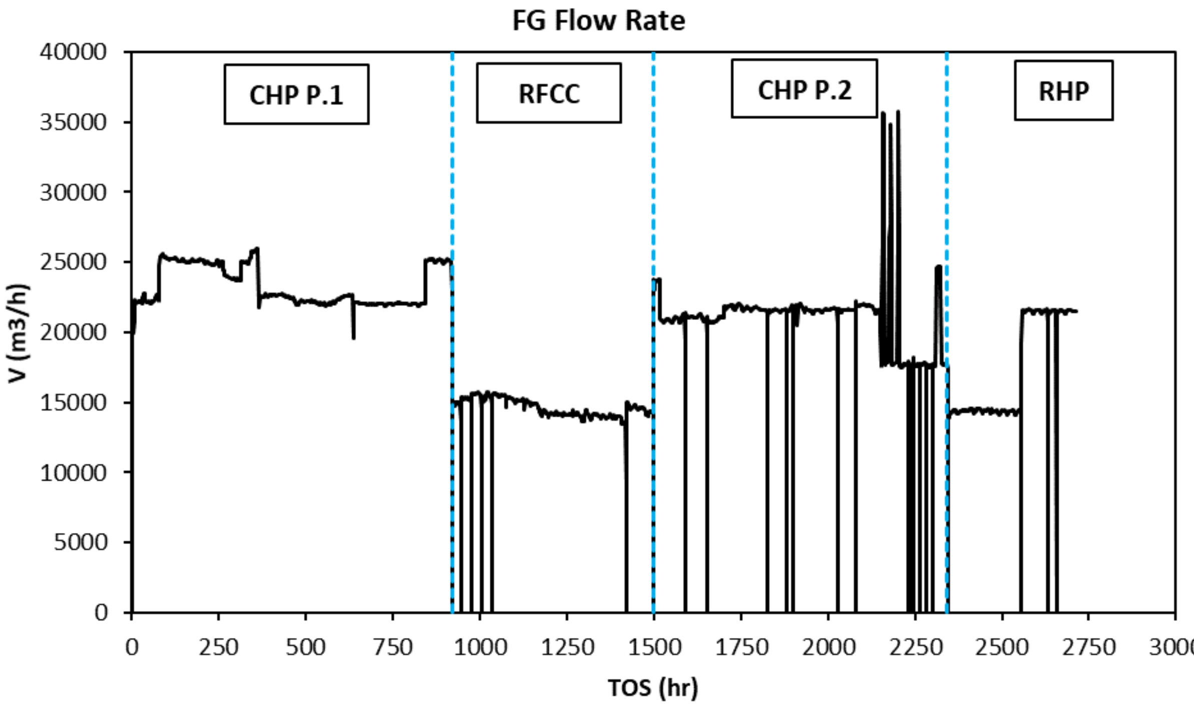
- Higher capacity pump for reboiler
- Force recirculation due to high boiling points of solvent components
- Equipment within budget

Completed Milestones

Task No.	MS No.	Milestone Description	Planned Completion Date	Actual Completion Date	Verification Method
1.0	1	Updated Project Management Plan (PMP)	Oct. 31, 2018	Sept. 5, 2018	PMP file
1.0	2	Project Kickoff Meeting	Oct. 31, 2018	Oct. 2, 2018	Presentation file
1.0	3	Initial TMP	Dec. 31, 2018	Dec. 31, 2018	TMP file
2.0	4	EH&S report as outlined in Appendix E of the FOA	Jan. 31, 2019	Jan. 31.2019	Topic report
3.0	5	Solvent qualification test results	July 31, 2019	January 17th, 2020	Quarterly report
4.0	6	FEED study and cost estimate	Dec. 31, 2019	February 4th, 2020	Quarterly report
5.0	7	Submit requisition for interstage cooler heat exchanger to fabricator	March 31, 2021	February 24, 2021	Quarterly report
5.0	8	Submission of purchase order to manufacturer for initial solvent fill	May 31, 2021	June 25, 2021	Quarterly report
5.0	9	Receive forced recirculation pump for regenerator for installation at host site	November 15, 2021	January 6th, 2022	Quarterly report
6.0	10	NAS solvent batch (75 tons) delivered to TCM site	December 31, 2021	January 31, 2022	Quarterly report
5.0	11	Commissioning of the revamped unit	January 31, 2022	March 07, 2022	Quarterly report
7.0	12	Test reports for parametric and long-term testing in revamped capture unit together with an updated State Point Data Table as defined in Appendix A of the FOA	June 30, 2022	June 30, 2022	Quarterly report
8	13	Confirmation of decommissioning and waste handling	September 30, 2022	September 30, 2022	Quarterly report
9	14	Final TEA according to DOE guidelines	May 7, 2023	May 22, 2023	Topical report
10	15	EH&S report as outlined in Appendix E of the FOA	June 30, 2023	July19, 2023	Topical report
10	16	Maturation Plan and Technology Gap Analysis following DOE guidelines in FOA appendices	June 30, 2023	TMP: July 19,2023 TGA:	TMP file and Gap Analysis report
7.3	17	Updated State Point Data Table	June 30, 2023	July 20,2023	Quarterly Report
7.5	18	NO_x Report	June 30, 2023	July 19, 2023	Topical report

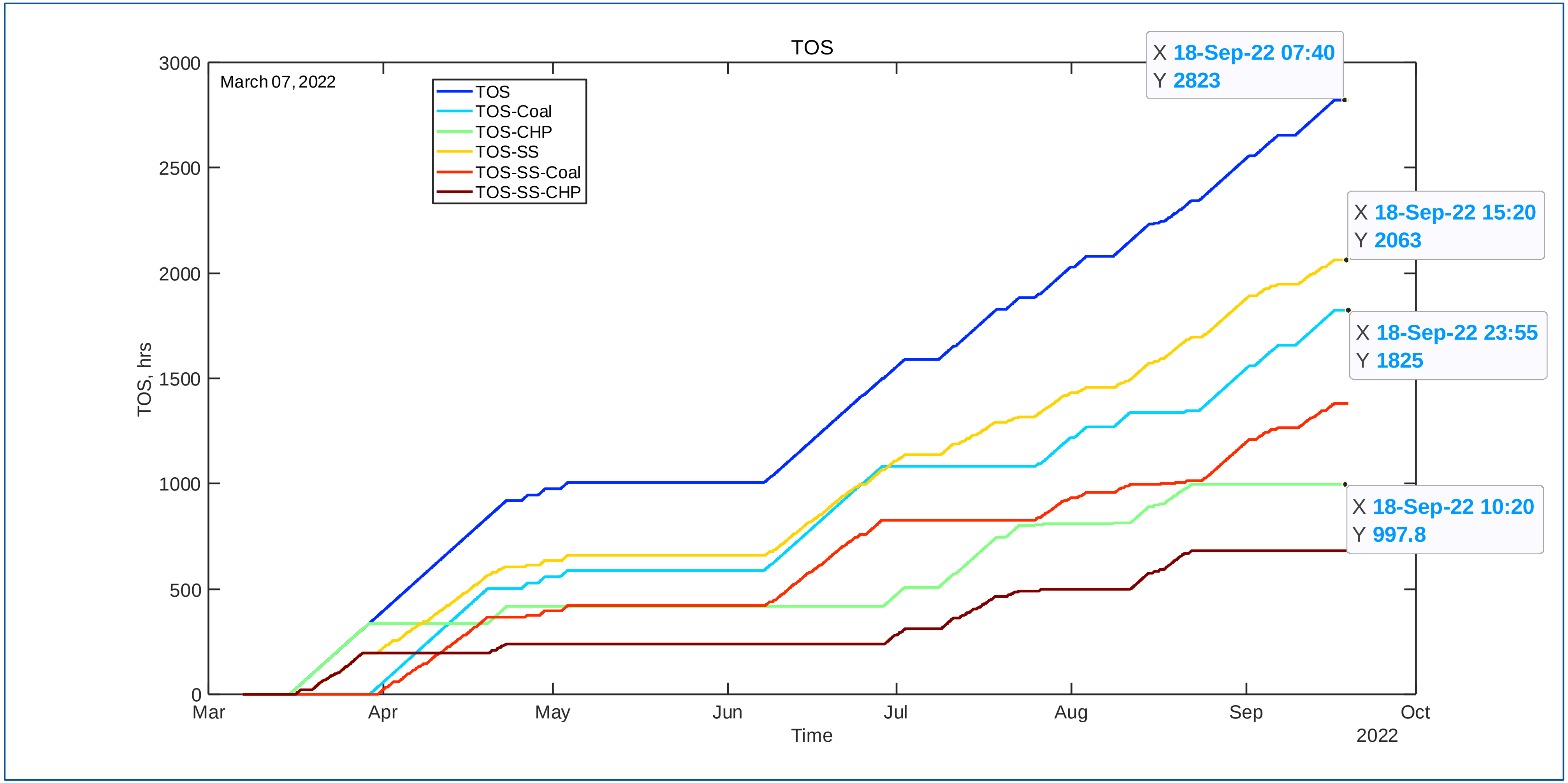
Test Campaign Segments and Flue Gas Characteristics





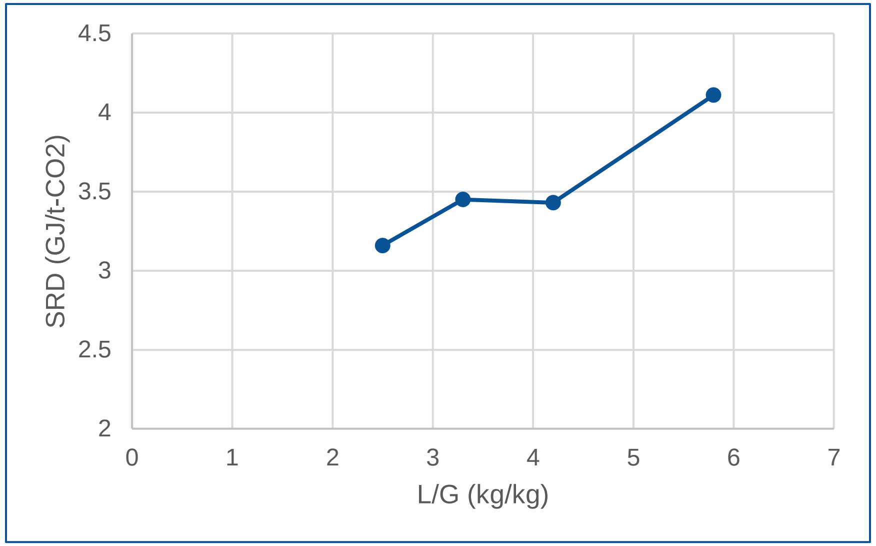
Flue Gas	CO_2 (vol %)	O_2 (vol%)	NO_2 (ppm)	NO (ppm)	SO_2 (ppm)
CHP	3.9	12.9	3.2	23.9	1.0
RFCC	14.7	2.4	1.2	66.5	0.0
CHP w/ Recycle (RFCC Mimic)	12.6	6.1	3.0	45.4	0.8
RHP (aka MHP)	13.7	4.6	4.6	50.9	0.4
RHP w/ Recycle (Cement Mimic)	18.0	4.6	5.0	3.4	0.0

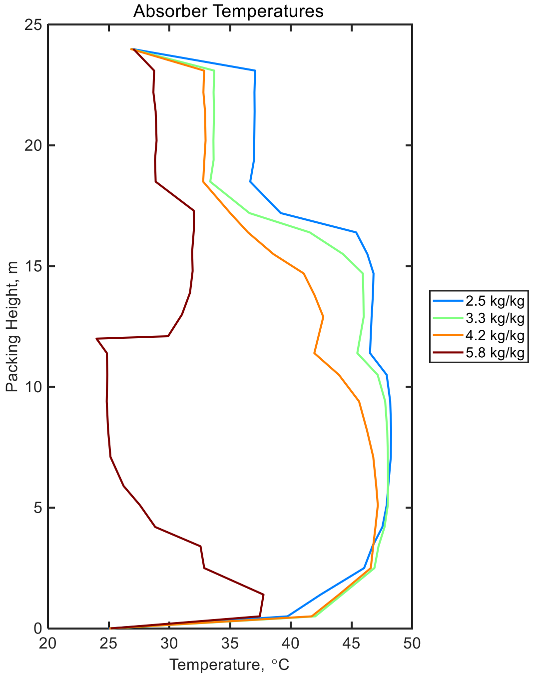
Time on Stream Highlights



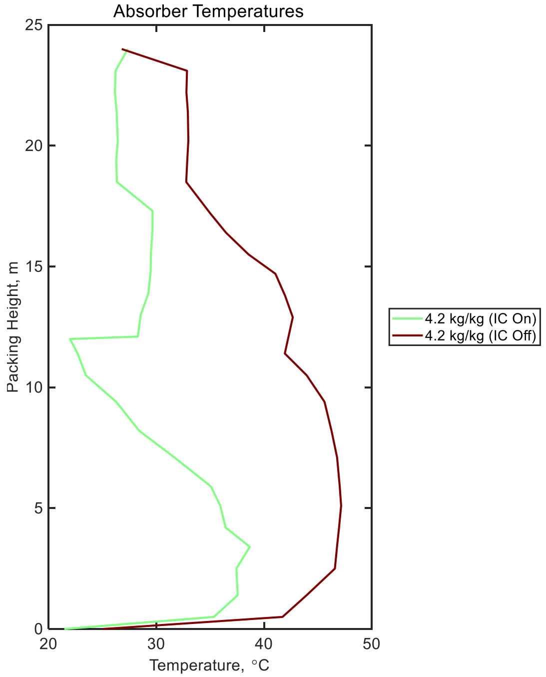
Time on stream:
2823 hours
Coal (RFCC):
1825 hours
NGCC (CHP):
998 hours
Steady state:
2063 hours

NGCC Performance: L/G Optimization

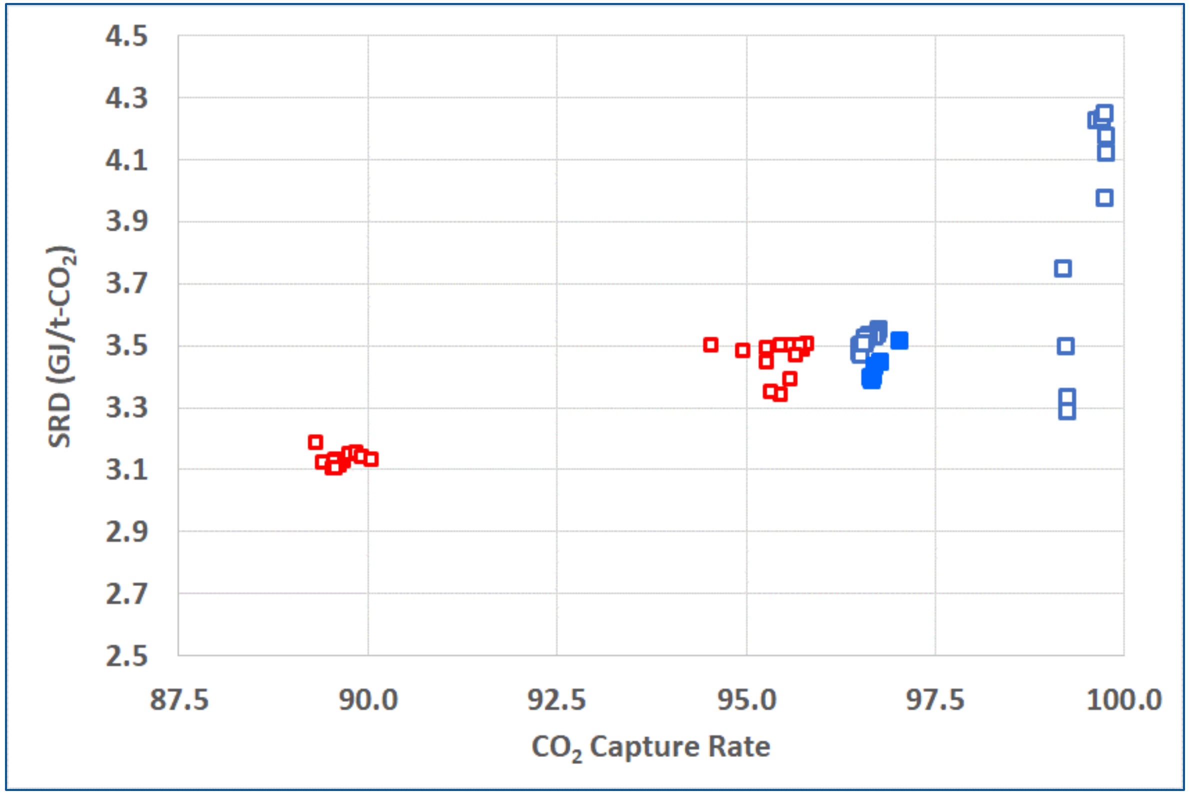




L/G Impact on bulge



Intercooler impact on bulge



NGCC SDoE Parametric Testing Results

Test Conditions

Run	L/G Ratio (kg/kg)	CO_2 Capture Rate (%)	Regen Pressure (barg)
1	4.5	95	1.0
2	4.0	95	1.0
3	3.0	85	1.0
4	3.5	90	1.0
5	3.5	85	2.1
6	4.0	90	2.1
7	3.0	95	2.1
8	2.5	90	2.1
9	3.5	95	3.2
10	3.0	90	3.2
11	2.5	85	3.2
12	4.5	85	3.2

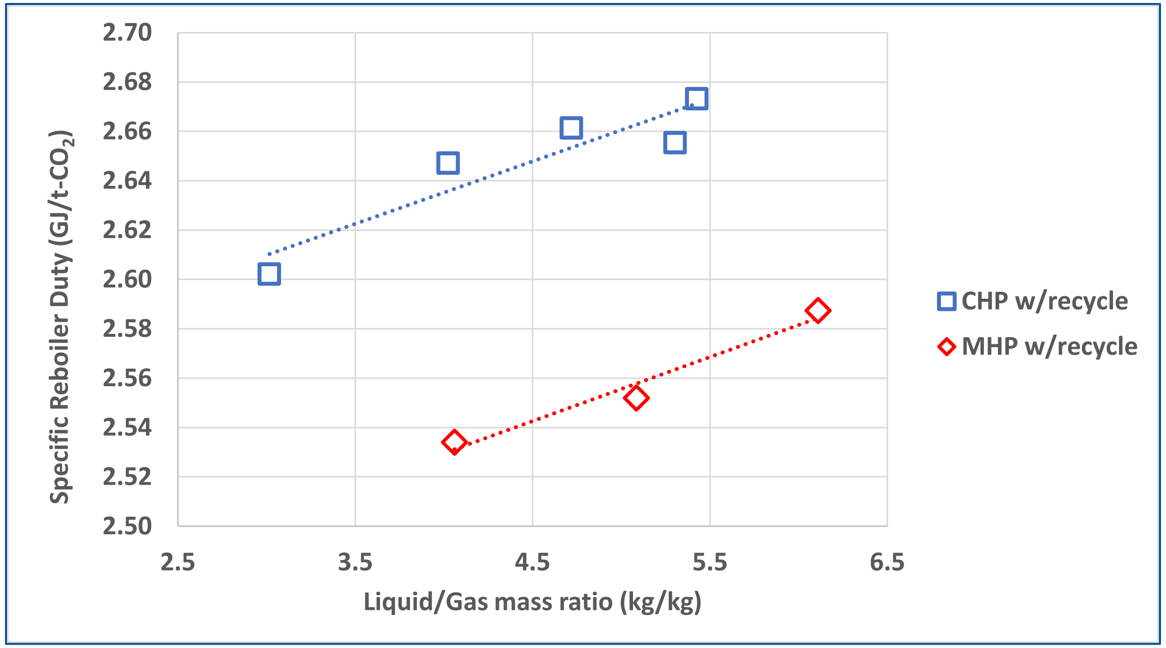
Results

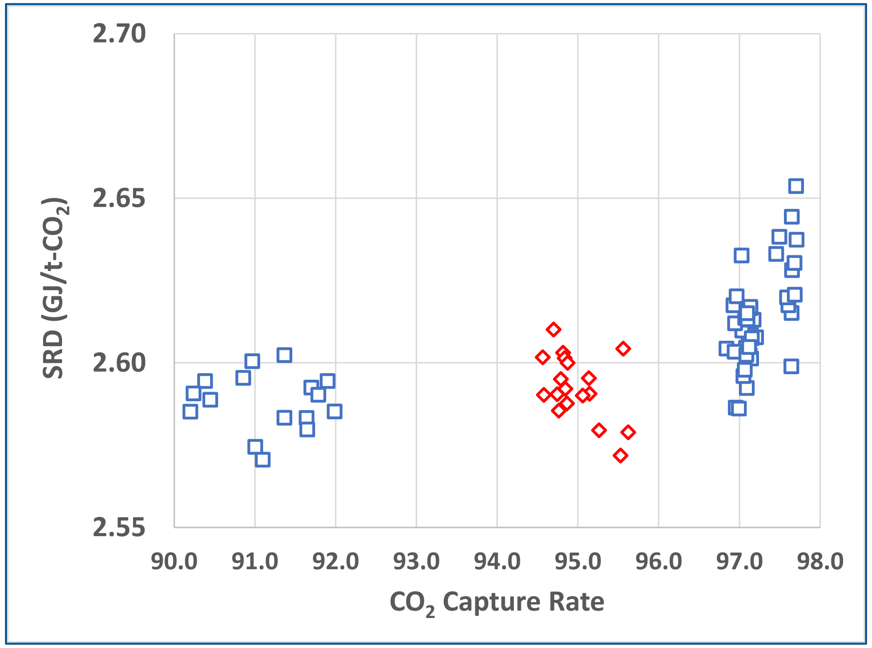
Run	Regenerator Pressure (barg)	Capture Rate	L/G (kg/kg)	Reboiler Temp (Celsius)	Flue gas flow (Sm^3/hr)	Observed T_approach (Celsius)	Observed SRD ($GJ/t\text{-}CO_2$)	SRD (w/ 5C T approach) ($GJ/t\text{-}CO_2$)
NGCC sDOE01	1.0	95.1	4.8	97.3	26861	15.4	5.85	3.60
NGCC sDOE02	1.0	95.4	4.2	95.7	26907	14.8	5.33	3.43
NGCC sDOE03	1.0	85.0	3.1	89.2	26932	14.4	4.63	3.13
NGCC sDOE04	1.0	90.3	3.7	90.5	26935	14.3	4.95	3.30
NGCC sDOE05	2.1	84.9	3.7	95.0	26927	16.1	5.32	3.32
NGCC sDOE06	2.1	90.3	4.2	96.9	26929	16.7	5.67	3.47
NGCC sDOE07	2.1	95.1	3.2	102.4	26928	15.6	4.65	3.14
NGCC sDOE08	2.1	89.8	2.6	100.7	26930	15.7	4.43	3.10
NGCC sDOE09	3.2	95.5	3.7	107.5	26976	16.9	4.85	3.11
NGCC sDOE10	3.2	90.5	3.1	104.5	26974	16.8	4.67	3.08
NGCC sDOE11	3.2	85.3	2.6	104.7	26977	16.7	4.38	3.01
NGCC sDOE12	3.2	85.3	4.7	99.6	26968	18.0	6.22	3.69

Impact

Variable	Weight
L/G	0.287
Capture rate	-0.034
Pressure	-0.025

Coal Performance: L/G Optimization





Gas	L/G (kg/kg)	L/G (kg/Sm³)	Flue Gas flowrate (Sm³/hr.)	CO_2 capture rate (%)	Regen Pressure (bar,g)	Reboiler Temp (Celsius)	SRD GJ/t-CO_2
CHP	5.4	7.0	28,420	89.7	0.96	94.3	2.67
CHP	5.3	6.8	28,994	90.0	0.96	94.8	2.66
CHP	4.7	6.1	28,443	89.9	0.96	97.2	2.66
CHP	4.0	5.2	28,205	90.5	0.95	100.5	2.65
CHP	3.0	3.9	28,103	90.0	0.95	105.4	2.60
MHP	6.1	7.7	27,847	91.0	3.17	106.3	2.59
MHP	5.1	6.5	27,863	90.4	3.17	110.0	2.55
MHP	4.1	5.1	27,854	89.6	3.16	115.1	2.53

Run	Stripper Pressure (barg)	Capture Rate	L/G (kg/kg)	Reboiler Temp (Celsius)	Flue gas flow (Sm³/hr)	SRD (w/ 5C Tapproach) GJ/t-CO2
RHP-1	3.2	91.0	6.11	106.3	21,982	2.59
Coal sDOE12a	3.2	95.0	6.52	107.0	21,982	2.59
CHC-2	3.2	97.1	6.11	112.2	21,982	2.61
CHC-3	3.2	97.6	6.11	113.9	21,982	2.63

Coal SDoE Parametric Testing Results

Results

Run	Stripper Pressure (barg)	Capture Rate	L/G (kg/kg)	Reboiler Temp (Celsius)	Flue gas flow ($Sm^3/hr.$)	SRD (w/ 5C Tapproach) GJ/t-CO_2
sDOE01	2.6	90.7	4.0	113.6	21,982	2.57
sDOE02	2.6	92.0	3.5	119.8	21,983	2.55
sDOE03	2.6	90.1	4.5	110.3	21,978	2.59
sDOE04	2.6	95.0	5.5	108.3	21,982	2.59
sDOE05	2.1	94.6	4.0	113.4	21,982	2.59
sDOE06	2.1	90.4	6.5	98.9	21,982	2.58
sDOE07	2.1	90.5	3.5	114.6	21,981	2.53
sDOE08	2.1	95.2	4.5	110.3	21,982	2.60
sDOE09	3.2	95.3	4.0	120.4	21,981	2.58
sDOE10	3.2	90.7	5.5	107.9	21,982	2.57
sDOE11	3.2	90.9	3.5	121.0	21,981	2.55
sDOE12	3.2	95.0	6.5	107.0	21,982	2.59

CCSI²
Carbon Capture Simulation for Industry Impact

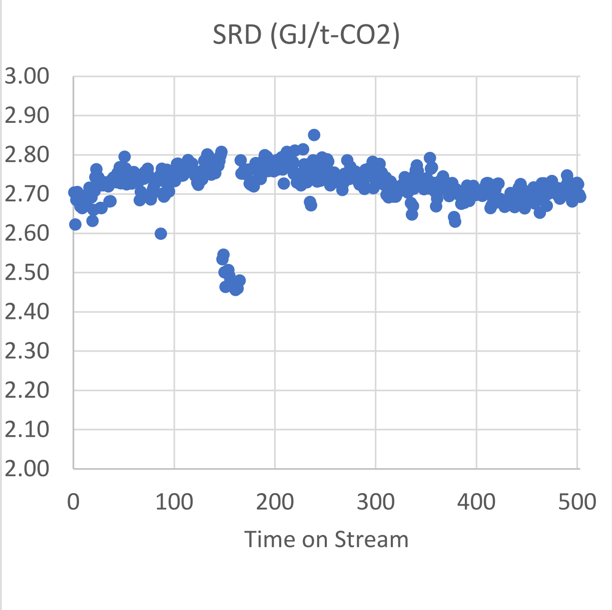
Test Conditions

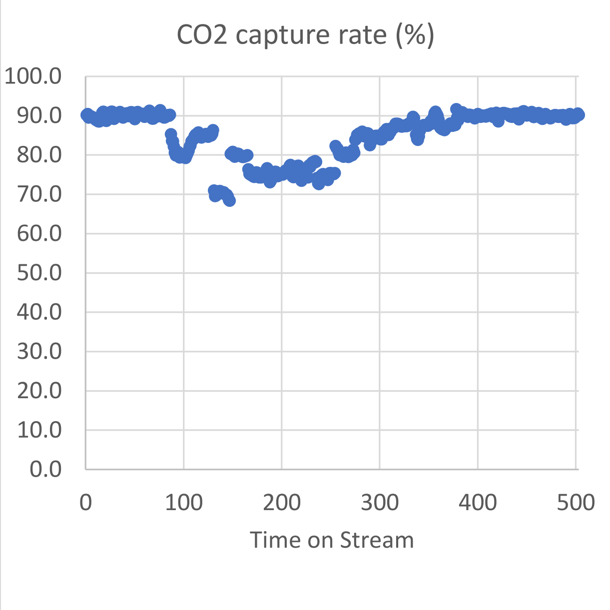
Run	L/G Ratio (kg/kg)	CO_2 Capture Rate (%)	Regen Pressure (bar,g)
1	4.5	95	1.0
2	4.0	95	1.0
3	3.0	85	1.0
4	3.5	90	1.0
5	3.5	85	2.1
6	4.0	90	2.1
7	3.0	95	2.1
8	2.5	90	2.1
9	3.5	95	3.2
10	3.0	90	3.2
11	2.5	85	3.2
12	4.5	85	3.2

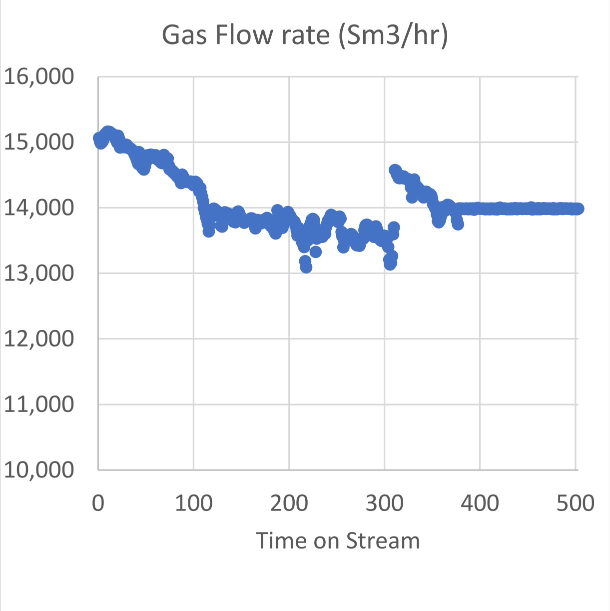
Impact

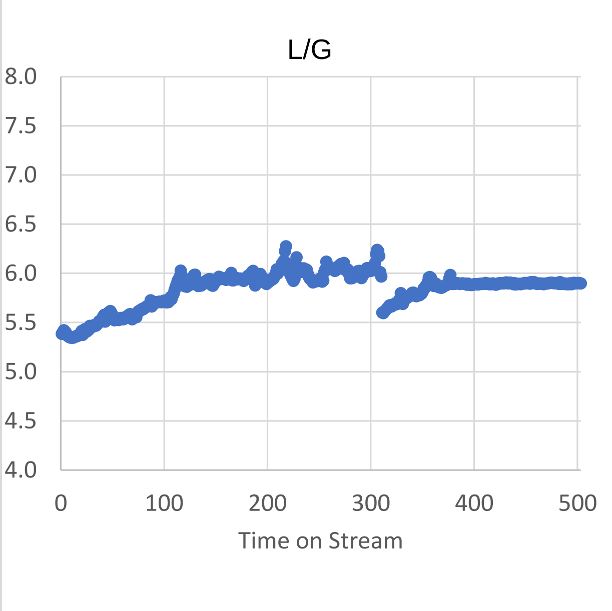
Variable	Weight
L/G	0.011
Capture rate	0.013
Pressure	-0.002

Coal Long Term Testing

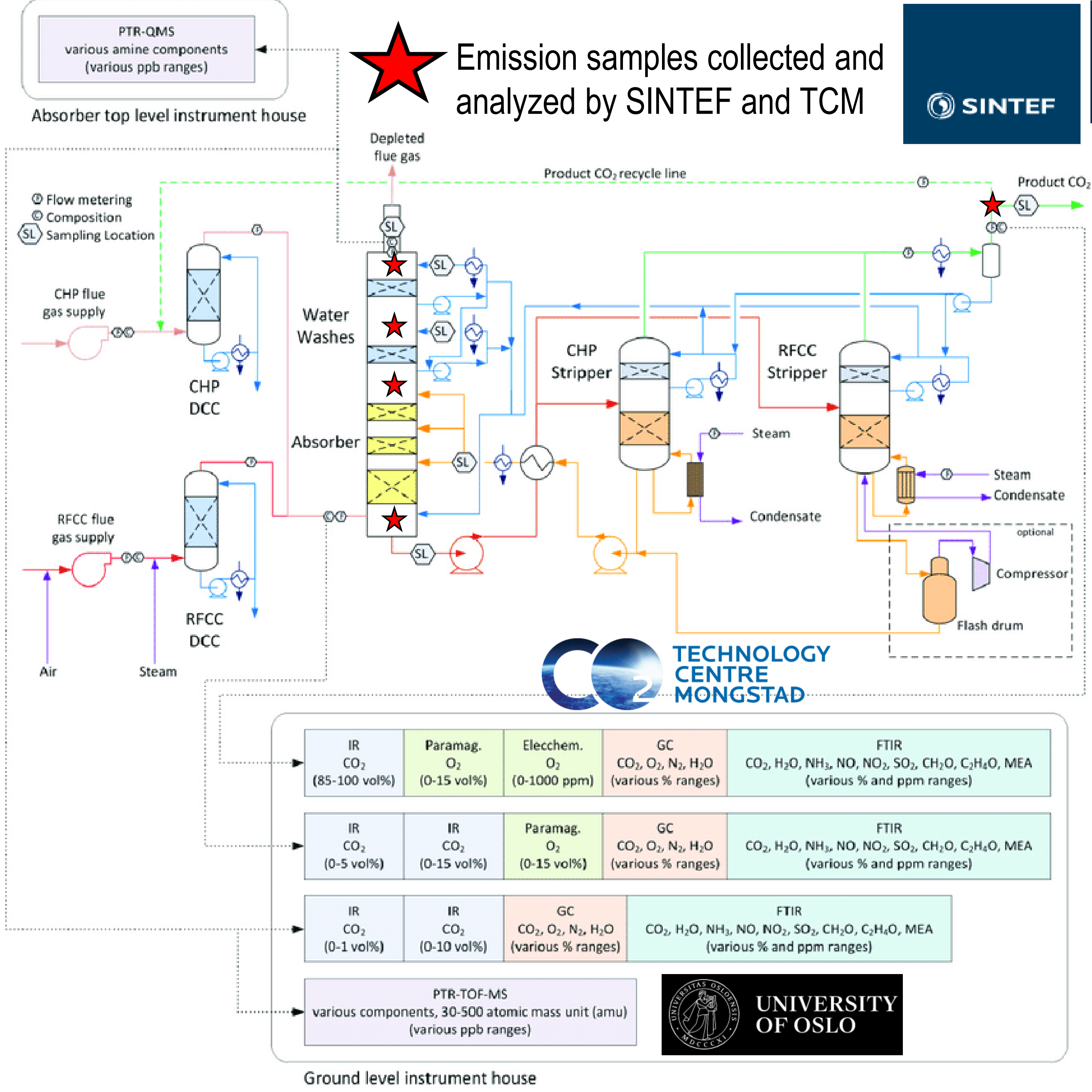


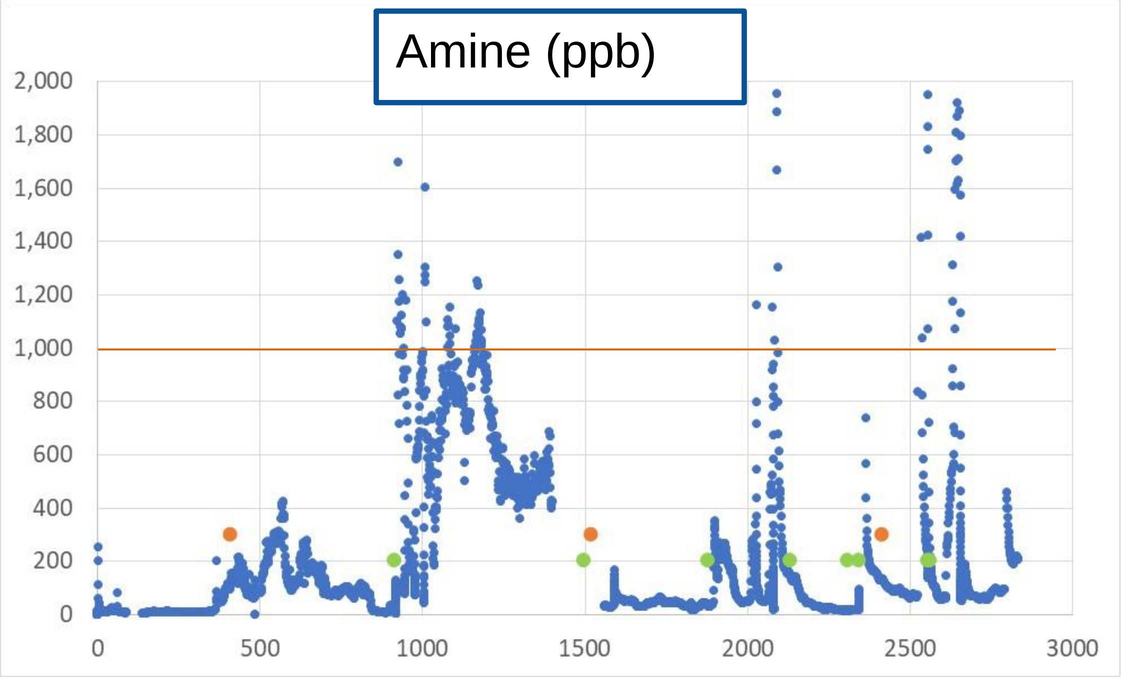






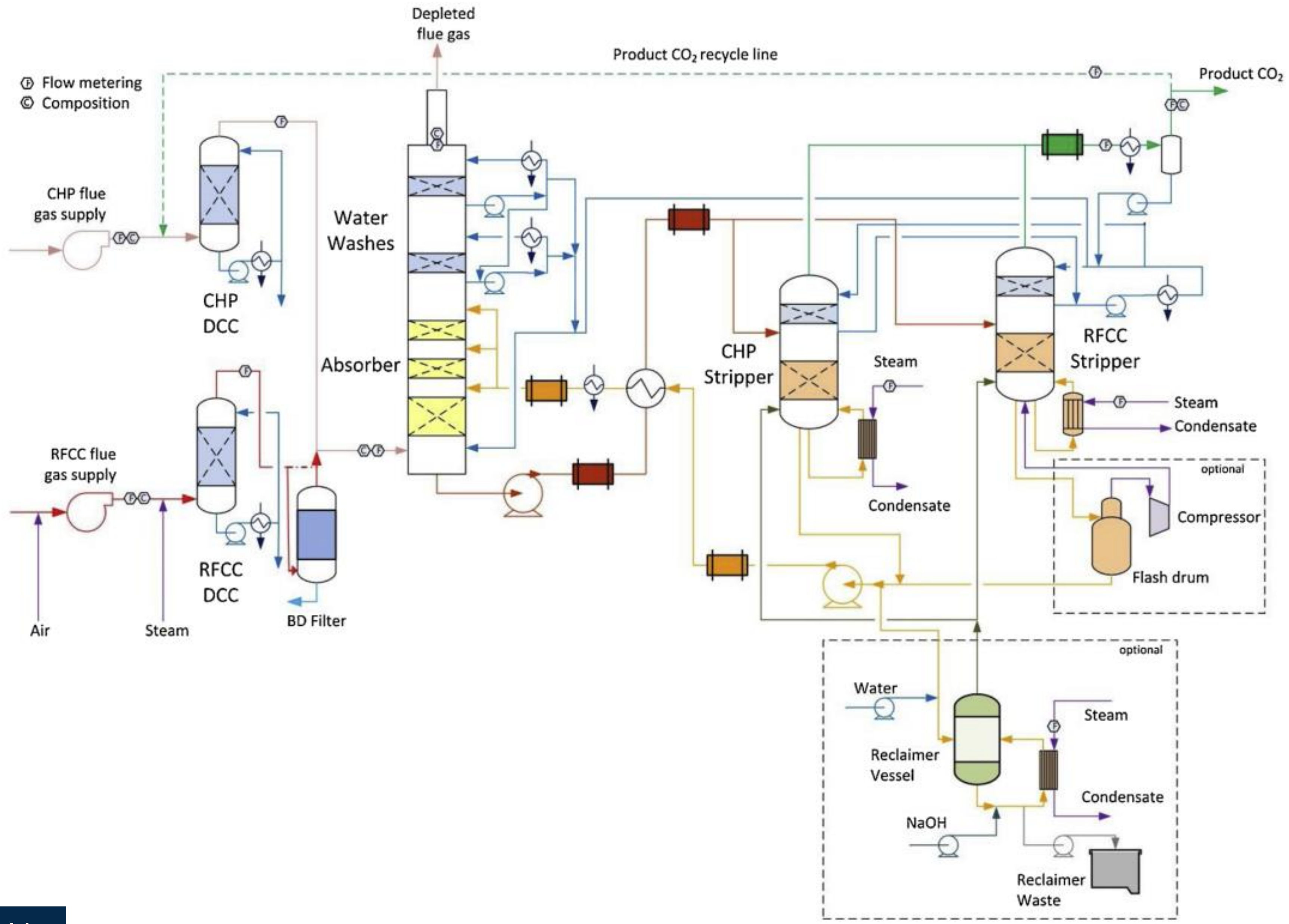
Emissions including PTR-TOF MS



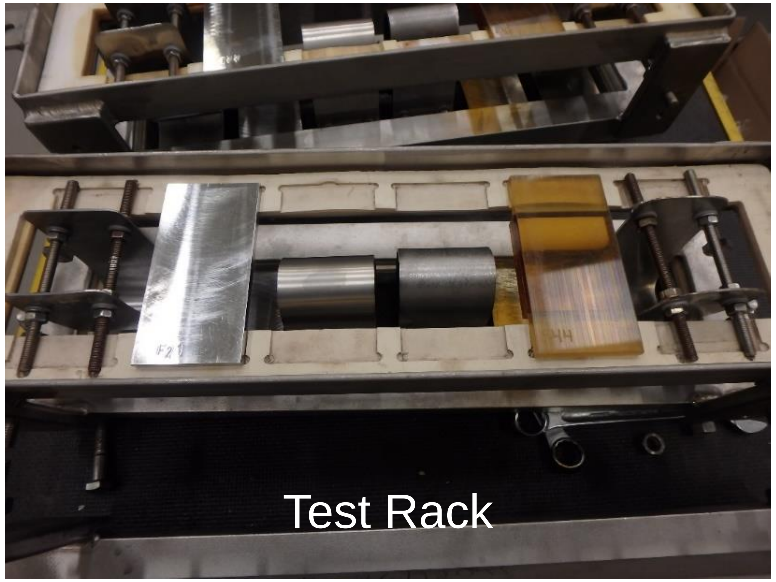


TOS (h)	Event (Green dots)
916	CHP ended, RFCC began
1499	RFCC ended, NGCC sDOE on CHP began
1881	NGCC sDOE ended, Coal sDOE began
2131	Coal sDOE ended, dynamic testing began
2331	Dynamic testing ended, deep capture NGCC began
2343	Deep capture NGCC ended, EF test began
2555	EF test ended, RHP test began

Corrosion Testing Process Locations

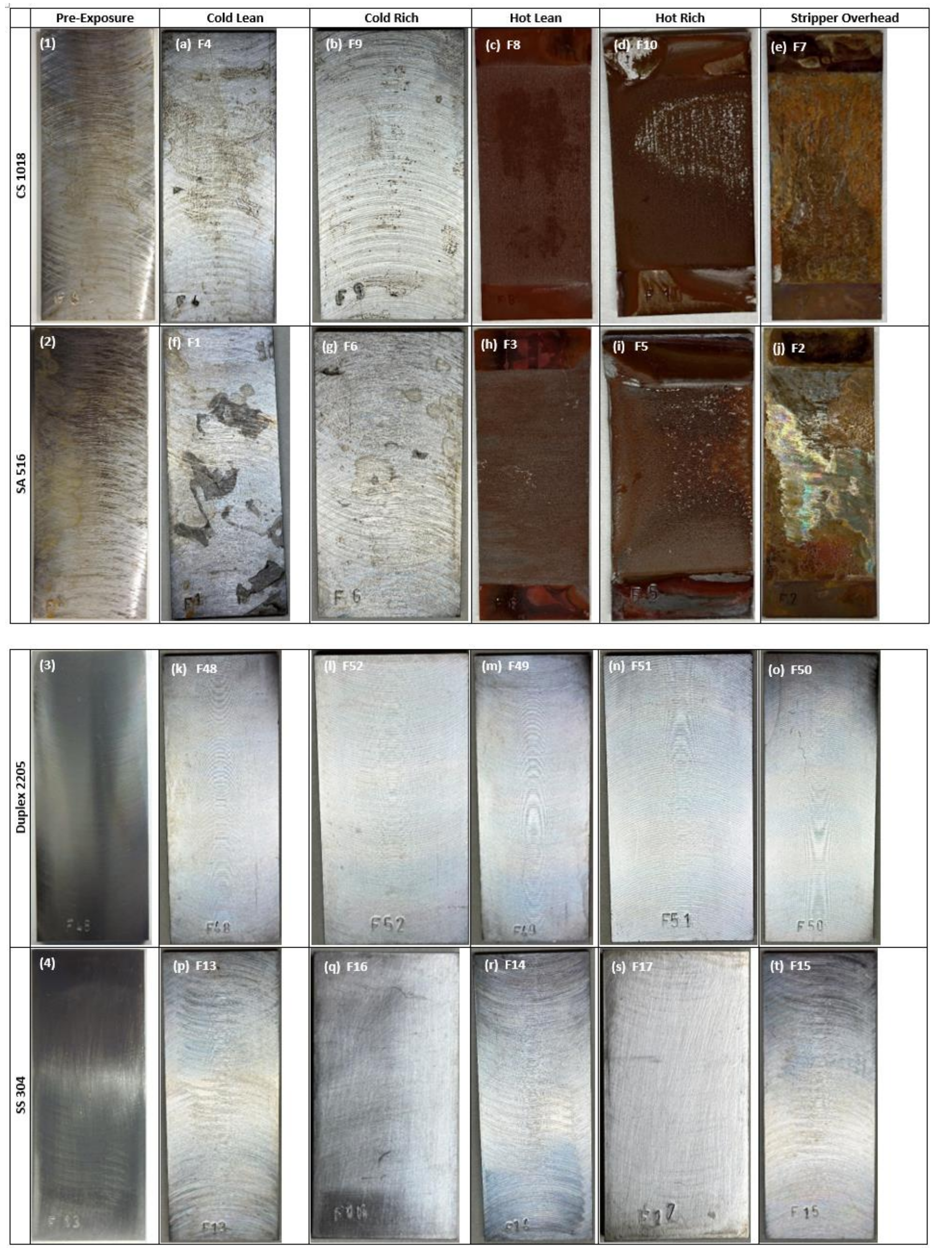


- MOC coupon sample holders
- Flat and bent
- 3 carbon steels
- 3 stainless steels
- 1 resin

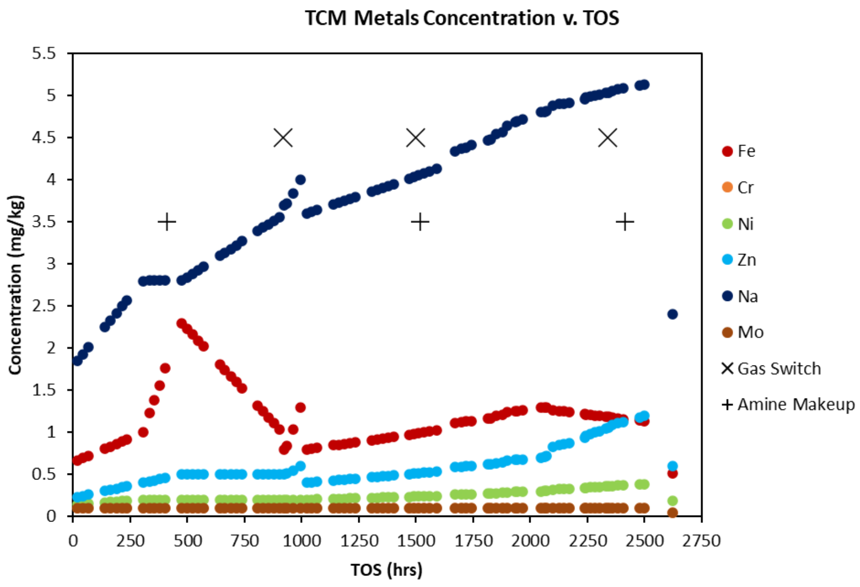


Test Rack

Corrosion Coupon Testing Results



Rating	Corrosion Rate (µm/yr)
Outstanding	<25
Excellent	25—100
Good	100—500
Fair	500—1000
Poor	1000—5000
Unacceptable	>5000



		Cold Lean (8" Line)	Cold Rich (6" Line)	Hot Lean (8" Line)	Hot Rich (6" Line)	Stripper Overhead (12" Line)
Carbon Steels	CS 1010	-0.03 ± 0.06	-0.07 ± 0.08	383.02 ± 46.83	Lost	-0.51 ± 0.07
	CS 1018	-0.01 ± 0.14	0.01 ± 0.21	376.00 ± 10.84	956.22 ± 33.07	-0.27 ± 0.14
	SA 516	0.18 ± 0.14	0.06 ± 0.21	343.21 ± 9.90	1167.12 ± 40.36	-0.37 ± 0.14
	SA 516 Bent	0.12 ± 0.07	-0.08 ± 0.08	414.97 ± 64.57	Lost	-0.09 ± 0.04
Stainless Steels	Duplex 2205	-0.18 ± 0.14	-0.21 ± 0.21	-0.12 ± 0.14	-0.10 ± 0.21	-0.08 ± 0.14
	Duplex 2205 Bent	-0.07 ± 0.06	-0.07 ± 0.08	-0.03 ± 0.06	-0.06 ± 0.08	0.00 ± 0.04
	SS 304	-0.02 ± 0.14	-0.01 ± 0.20	0.00 ± 0.14	0.03 ± 0.20	0.00 ± 0.14
	SS 304 Bent	-0.04 ± 0.06	-0.03 ± 0.08	-0.02 ± 0.06	-0.01 ± 0.08	-0.02 ± 0.04
	SS 316	-0.03 ± 0.14	-0.01 ± 0.20	0.00 ± 0.14	0.02 ± 0.20	0.00 ± 0.14
Resin	Ultem Resin	-33.24 ± 5.73	20.85 ± 4.30	Lost	Lost	22.37 ± 3.89

TEA Break-Even Summary of Cases

Table 6.1 RTI NAS Case Summary

Power Plant	SC PC				NGCC (F-Class CT)				NGCC (H-Class CT)			
Capture Rate, %	90	95	97	99	90	95	97	99	90	95	97	99
Total Gross Power, MWe	762	756	763	774	692	689	687	687	946	942	939	939
Net Power, MWe	657	648	653	650	647	641	635	631	888	880	872	866
BEC for Capture System, $MM	$226	$230	$232	$236	$221	$260	$256	$295	$290	$340	$340	$394
TPC, $MM	$2,085	$2,092	$2,102	$2,130	$935	$1,001	$1,001	$1,075	$1,284	$1,370	$1,378	$1,481
TPC, $/kW	$3,175	$3,229	$3,219	$3,277	$1,444	$1,562	$1,576	$1,705	$1,445	$1,558	$1,580	$1,711
TOC, $MM	$2,558	$2,567	$2,579	$2,613	$1,166	$1,246	$1,247	$1,336	$1,599	$1,704	$1,743	$1,837
TOC, $/kW	$3,895	$3,963	$3,950	$4,021	$1,802	$1,944	$1,962	$2,119	$1,800	$1,936	$1,999	$2,122
LCOE (excl. T&S), $/kW	$92.60	$94.60	$94.30	$96.00	$59.80	$62.50	$63.00	$65.70	$58.60	$61.00	$61.90	$64.50
BESP, $/t-$CO_2$	$30.50	$30.50	$29.80	$30.60	$47.70	$52.00	$52.00	$57.30	$47.40	$51.10	$51.80	$57.50

Continuation of the Technology Development Path with DOE

FLECCS – Dynamic Capture from NGCC

(2021-2024)

Process intensification to enable flexible capture, reduce capital expense

100 t-CO_2/day

TRL 2-3

arpa·e

Large Pilot Testing for Cement Flue Gas

(2021-2024)

Process intensified absorbers to reduce capital expense from cement flue gas capture

1.0 t-CO_2/day

TRL 4-5

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

GEN2NAS

(2023-2024)

Improved solvent chemistry with process intensification for higher capture rates at lower cost.

0.0015 t-CO_2/day

TRL 2-3

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

FEED

(2023-2024)

Carbon capture plant FEED study for cement manufacturing

4000 t-CO_2/day

TRL 6

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

Carbon Capture Pilot Plant

(2024-2029)

Carbon capture pilot plant at pulp and paper containerboard plant

400 t-CO_2/day

TRL 7

Office of CLEAN ENERGY DEMONSTRATIONS

Projects currently underway or recently selected for negotiation

Lessons Learned

- Trace emissions from solvent production may be present at start-up unless steps are taken during manufacturing to remove them.

- PTR-TOF-MS is an effective tool for quickly identifying volatiles and monitoring at low levels of emission.

- Oxidative degradation from NO_x produces volatile by products which must be managed. It appears this can be accomplished with an acid wash.

- Heat exchangers must be sized appropriately for NAS to optimize performance.

- High efficiency CO_2 capture from NGCC can be achieved with NAS with higher SRD and cost.

Commercialization with SLB

News Release

Schlumberger and RTI International Partner to Accelerate the Industrialization of Innovative Carbon Capture Technology

Published: 10/17/2022

A unique, versatile nonaqueous solvent

SLB and RTI International have partnered to industrialize and scale up an absorption-based carbon capture technology. The proprietary nonaqueous solvent (NAS) can be applied across a broad range of industrial sectors—from cement and steel manufacturing, coal and gas power generation, chemicals, and hydrogen.

With low energy consumption, simple process configuration, low corrosion chemistry, and fast reaction rates, NAS technology reduces energy consumption by up to 40% during CO_2 capture and minimizes both capex and opex compared with traditional solvents.

Read press release →

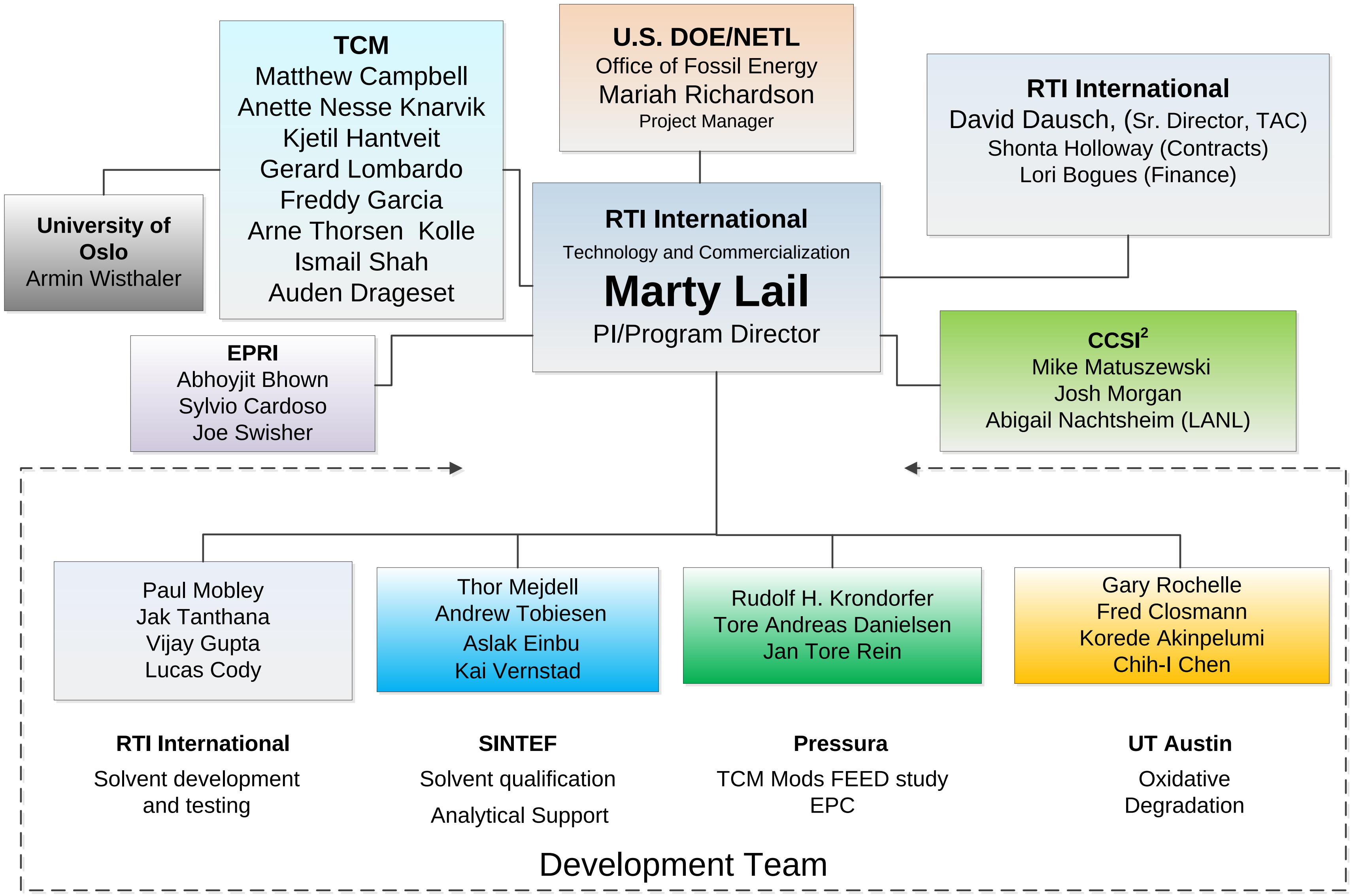
RTI Non-Aqueous Solvent (NAS)-based CO_2 Capture at TCM (DE-FE0031590)

- >2,800 hours testing of coal and NGCC flue gases
- Utilized sDOE for most efficient parametric testing
- Achieved target SRD's
- Showed >99% capture CO_2 from NGCC
- Operated below emission limits
- Found low corrosion rates on carbon steel
- Conducted 12 TEA case studies (90-99% capture)
- Commercializing with SLB

Thanks! RTI's New Energy Technology Development Facility Expansion 2025

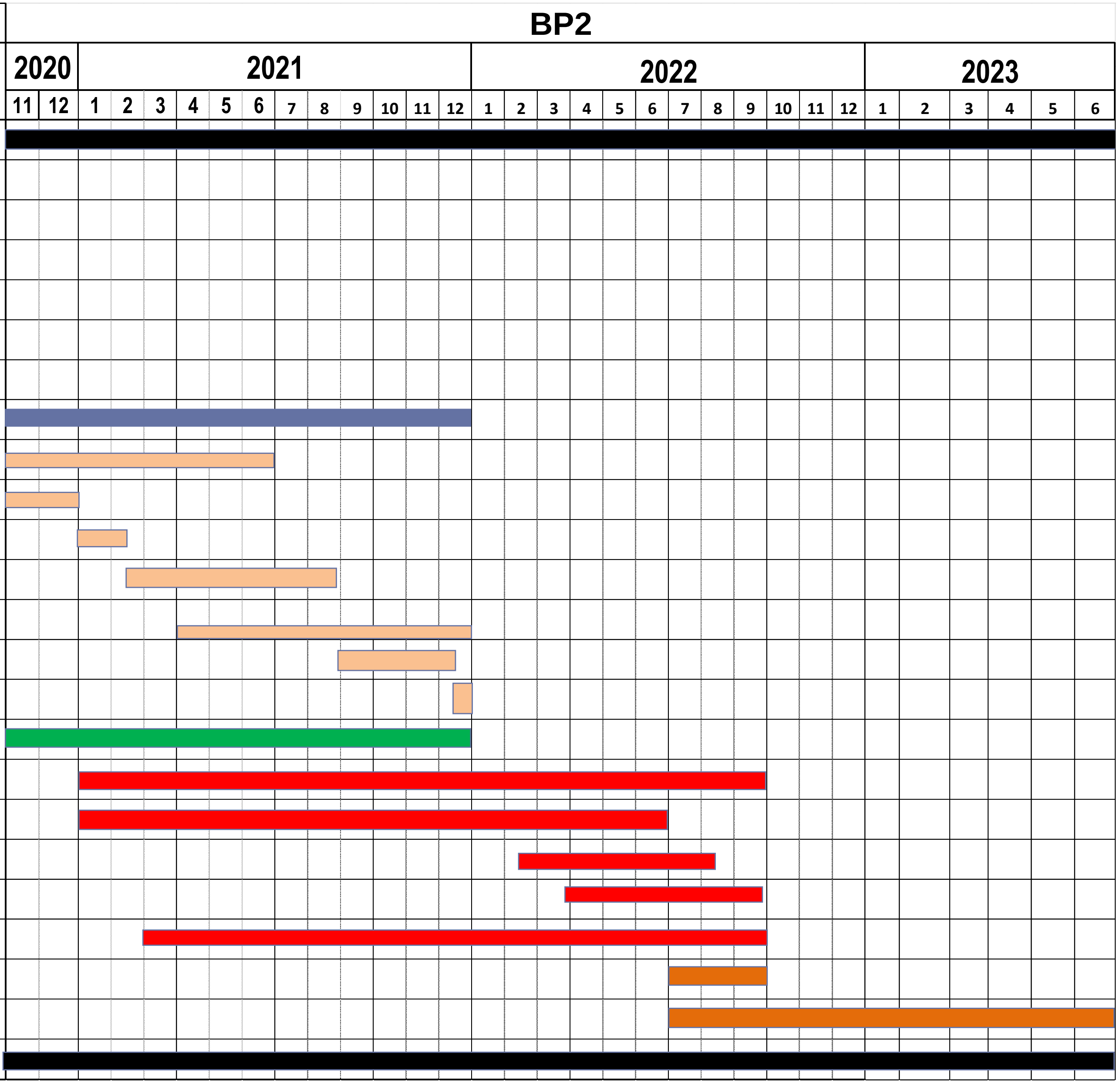
Marty Lail, Ph.D.
Senior Director, Decarbonization Sciences
RTI International
3040 Cornwallis Rd.
Research Triangle Park, NC 27709
919-485-5703 (o)
919-809-2204 (l)

Organizational Chart



Gantt Chart

#	Task title	Start date	End date
1.0	Project Management and Planning	08/08/18	12/31/22
	1.1 Test Agreement with TCM	08/08/18	09/30/20
2.0	EH&S and Risk Evaluation and Permitting	08/08/18	02/28/19
3.0	Solvent Qualification	03/01/19	01/31/20
4.0	Preliminary Design of a NAS Optimized System	08/01/19	07/31/20
	4.1 Pre-FEED	08/01/19	09/30/19
	4.2 FEED study	10/01/19	02/28/20
5.0	Revamp Implementation	10/01/20	12/31/21
	5.1 Detailed Engineering and Procurement	10/01/20	06/30/21
	5.11 Design Freeze	11/01/20	12/31/20
	5.12 Long Lead Items Ordered	01/01/21	02/12/21
	5.13 Long Lead Items Received	02/12/21	09/01/21
	5.2 Interstage Cooler and Recirculation Pump Install	04/01/21	12/31/21
	5.21 Installation and Commisisoning	09/01/21	12/15/21
	5.22 Mod Project Closeout	12/15/21	12/31/21
6.0	Solvent Production	10/01/20	12/03/21
7.0	Test Plan Development, Testing, Data Analysis	01/01/21	06/30/22
	7.1 Modified Amine Plant Test Plan Development		
	7.2 NAS Modified Amine Plant Testing		
	7.3 NAS Modified Amine Plant Data Analysis		
	7.4 EPRI Third Party Verification		
8.0	Decommissioning and Waste Handling	07/01/22	09/30/22
9.0	Final TEA (550 MW Net)	07/01/22	12/31/22
10.0	Cost Benefit Analysis and Technology Mat Planning	10/01/20	12/31/22



Technoeconomic Analyses, 2023

EPRI ELECTRIC POWER RESEARCH INSTITUTE | NexantECA | RTI INTERNATIONAL

SC PC 97% Capture

Plant	B12B.97-RTI NAS
Gross Size	763 MWe
Net Size	653 MWe
Capacity Factor (CF)	85%
Total As-Spent Cost/Total Overnight Cost Ratio	1.154
Fixed Charge Rate (FCR)	0.0707
Total Overnight Cost (TOC), $MM	$2,579
Total As-Spent Cost (TASC), $MM	$2,977
Fixed Operating Cost, $MM	$67.8
Variable Operating Cost @ 100% CF, $MM	$73.2
Fuel Cost @ 100% CF, $MM	$138.8
Annual MWh (100% CF)	5,720,222
LCOE Breakdown, $/MWh	
Capital Charges	$43.3
Fixed O&M	$13.9
Variable O&M	$12.8
Fuel	$24.3
LCOE (excl. CO_2 T&S), $/MWh	$94.3
CO_2 T&S	$10.0
LCOE (incl. CO_2 T&S), $/MWh	$104.3
Breakeven CO_2 Sales Price, $/t-CO2	$29.8

NGCC F-class 95% Capture

Plant	B31B.95-RTI NAS
Gross Size	689 MWe
Net Size	641 MWe
Capacity Factor (CF)	85%
Total As-Spent Cost/Total Overnight Cost Ratio	1.093
Fixed Charge Rate (FCR)	0.0707
Total Overnight Cost (TOC), $MM	$1,246
Total As-Spent Cost (TASC), $MM	$1,362
Fixed Operating Cost, $MM	$31.5
Variable Operating Cost @ 100% CF, $MM	$21.4
Fuel Cost @ 100% CF, $MM	$179.0
Annual MWh (100% CF)	5,613,735
LCOE Breakdown, $/MWh	
Capital Charges	$20.2
Fixed O&M	$6.6
Variable O&M	$3.8
Fuel	$31.9
LCOE (excl. CO_2 T&S), $/MWh	$62.5
CO_2 T&S	$3.7
LCOE (incl. CO_2 T&S), $/MWh	$66.2
Breakeven CO_2 Sales Price, $/t-CO2	$52.0

NGCC H-class 99% Capture

Plant	B32B.99-RTI NAS
Gross Size	939 MWe
Net Size	866 MWe
Capacity Factor (CF)	85%
Total As-Spent Cost/Total Overnight Cost Ratio	1.093
Fixed Charge Rate (FCR)	0.0707
Total Overnight Cost (TOC), $MM	$1,837
Total As-Spent Cost (TASC), $MM	$2,008
Fixed Operating Cost, $MM	$44.9
Variable Operating Cost @ 100% CF, $MM	$31.4
Fuel Cost @ 100% CF, $MM	$238.0
Annual MWh (100% CF)	7,582,958
LCOE Breakdown, $/MWh	
Capital Charges	$22.0
Fixed O&M	$7.0
Variable O&M	$4.1
Fuel	$31.4
LCOE (excl. CO_2 T&S), $/MWh	$64.5
CO_2 T&S	$3.8
LCOE (incl. CO_2 T&S), $/MWh	$68.3
Breakeven CO_2 Sales Price, $/t-CO2	$57.5