

# ***“Validation of Transformational CO<sub>2</sub> Capture Solvent Technology with Revolutionary Stability” (Apollo)***

DE-FE0031727 – 2019 NETL Project Review Meeting

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# ION's CO<sub>2</sub> Capture Technology Development / ICE-21

*Accelerated development path leveraging existing research facilities*



**2010**

**ION Engineering  
Lab-pilot  
0.01 MWe  
Boulder, CO, USA**



**2012**

**Univ. of N. Dakota  
EERC  
0.05 MWe  
Grand Forks, ND, USA**



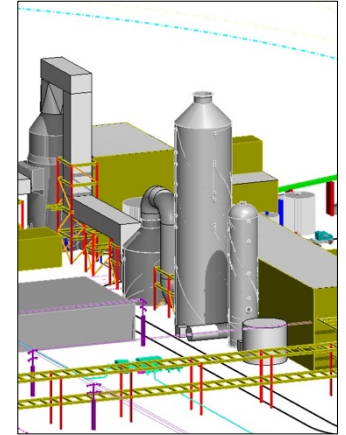
**2015**

**National Carbon  
Capture Center  
0.5 MWe  
Wilsonville, AL, USA**



**2016 - 2017**

**CO<sub>2</sub> Technology  
Centre Mongstad  
12 MWe  
Mongstad, Norway**



**2018 - 2019**

**Design & Costing  
Commercial Retrofit  
300 MWe  
Sutherland, NE, USA**

# DE-FE0031727: Apollo project

- Overall Project Objective:  
Scaling up a novel amine-based solvent technology with transformational stability and excellent CO<sub>2</sub> capture performance from a bench-scale to a 0.6 MWe scale using real flue gas.
- Budget:
  - DOE-NETL: \$2,999,998
  - ION and partners: \$750,000
- Period of Performance:
  - June 1<sup>st</sup>, 2019 to May 31<sup>st</sup>, 2021

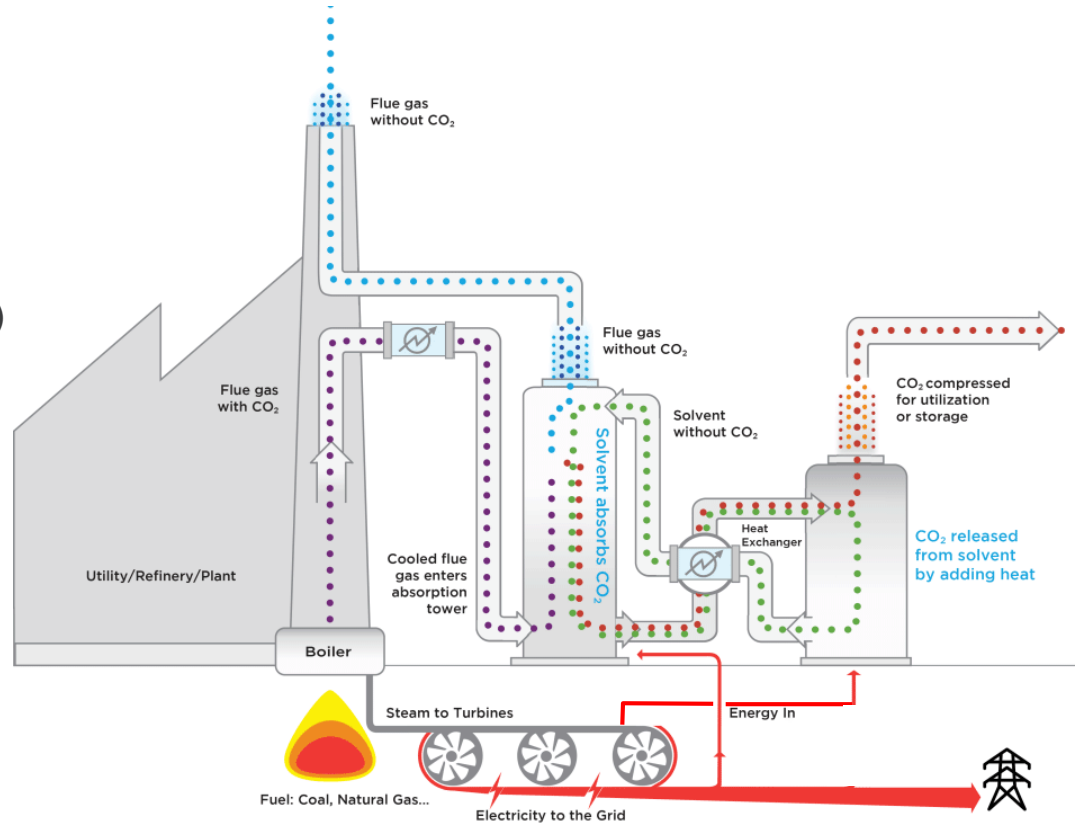


PSTU, NCCC, Wilsonville, AL (Courtesy of NCCC)

# ICE-31

## Basis of Performance

- Low energy consumption (lower than ICE-21)
- Fast kinetics (similar to ICE-21)
- Working capacity (higher than ICE-21)
- Low heat capacity (similar to ICE-21)
- Low corrosion (similar to ICE-21)
- Transformational stability (much better than MEA or ICE-21)



# Technical Objectives

- Parametric testing: determine operating window and validate ProTreat<sup>®</sup> model
- Long-term operation to demonstrate stability of ICE-31
- Dynamic operations to determine maximum ramp-rates, minimize energy consumption and emissions
- Upsets to determine process and solvent stability:
  - Increased O<sub>2</sub> concentration
  - Increased stripper temperature
  - Unplanned FGD outage
  - Unplanned DCC outage

# Project Schedule

ION Clean Energy CO <sub>2</sub> Capture Campaign at NCCC 2019/2020		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21
		Q2	Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2	
Task 1	Project Management	M1, M2		M3		M4	M5	M6, M8	M7				M9, M12	M10		M11							M13-16		M17
Task 2	Laboratory Scale Evaluations																								
	2.1 Solvent Properties Lab Work																								
	2.2 Process Modelling																								
	2.3 Thermal and Oxidative Stability Study																								
	2.4 PDF Operation																								
	2.5 MLA																								
Task 3	Host Site Prep & Test Plan Development																								
	3.1 Campaign Test Plan																								
	3.2 Campaign EH&S																								
	3.3 Host Site Preparation																								
Task 4	Test Campaign																								
	4.1 Test Campaign																								
	4.2 Lab Analysis																								
	4.3 Data Evaluation																								
Task 5	Final Reporting																								
	5.1 Process Model Validation																								
	5.2 TEA																								
	5.3 State Point Data Table																								
	5.4 Technology Gap Analysis																								
	5.5 EH&S Risk Assessment																								
	5.6 Technology Maturation Plan																								
	5.7 Final Reporting																								

## ION Team:

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Ned Brown, Kelly Sias, Buz Brown, Erik Meuleman

## Department of Energy:

Jason Hissam, Lynn Brickett, José Figueroa, Bethan Young, Jeff Kooser

## THANKS



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