



HOW LOW CAN WE GO?

ICE-31 AND DEEP DECARBONIZATION AT TCM

**NET-ZERO FLEXIBLE POWER: HIGH CAPTURE RATE PROJECT REVIEW MEETING
JUNE 6-7, 2024**

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JUNE 5, 2024



ION CLEAN ENERGY

WE'VE BUILT A BETTER MOUSETRAP

More effective and cost-efficient technologies for use by point sources including natural gas and coal-fired power generators and industrial emitters.

US DOE SUPPORT

Awarded over \$85 million in highly competitive, peer-reviewed U.S. Department of Energy cooperative agreements.

TRANSFORMATIVE PILOT PERFORMANCE

Exceptional test results at National Carbon Capture Center in Alabama and Technology Centre Mongstad in Norway, the world's largest & most advanced carbon capture test facility.



BOULDER, CO

ION - NETL NET-ZERO





SETTING A NEW SOLVENT STANDARD

EXTREMELY LOW EMISSIONS

Emissions from our solvent fall below detectable levels of current CEMS, allowing our customers to operate within existing air permits.

UNPRECEDENTED SOLVENT STABILITY

Extreme stability extends the life of the solvent without losing capture efficiency. As a result, cost and frequency of solvent replacement is decreased.

FASTER SOLVENT KINETICS

ION solvent creates a faster and higher capacity reaction with CO₂, requiring less solvent to capture emissions, smaller equipment and lower transportation costs.

LOWER ENERGY REQUIREMENTS

ION solvent requires less energy for operation so our customers can keep their costs down, even at capture efficiency rates over 95%.



ION'S CAMPAIGN AT TCM – 2023-2024

VALIDATE RESULTS FROM NATIONAL CARBON CAPTURE CENTER PSTU AT SCALE > 10 MW

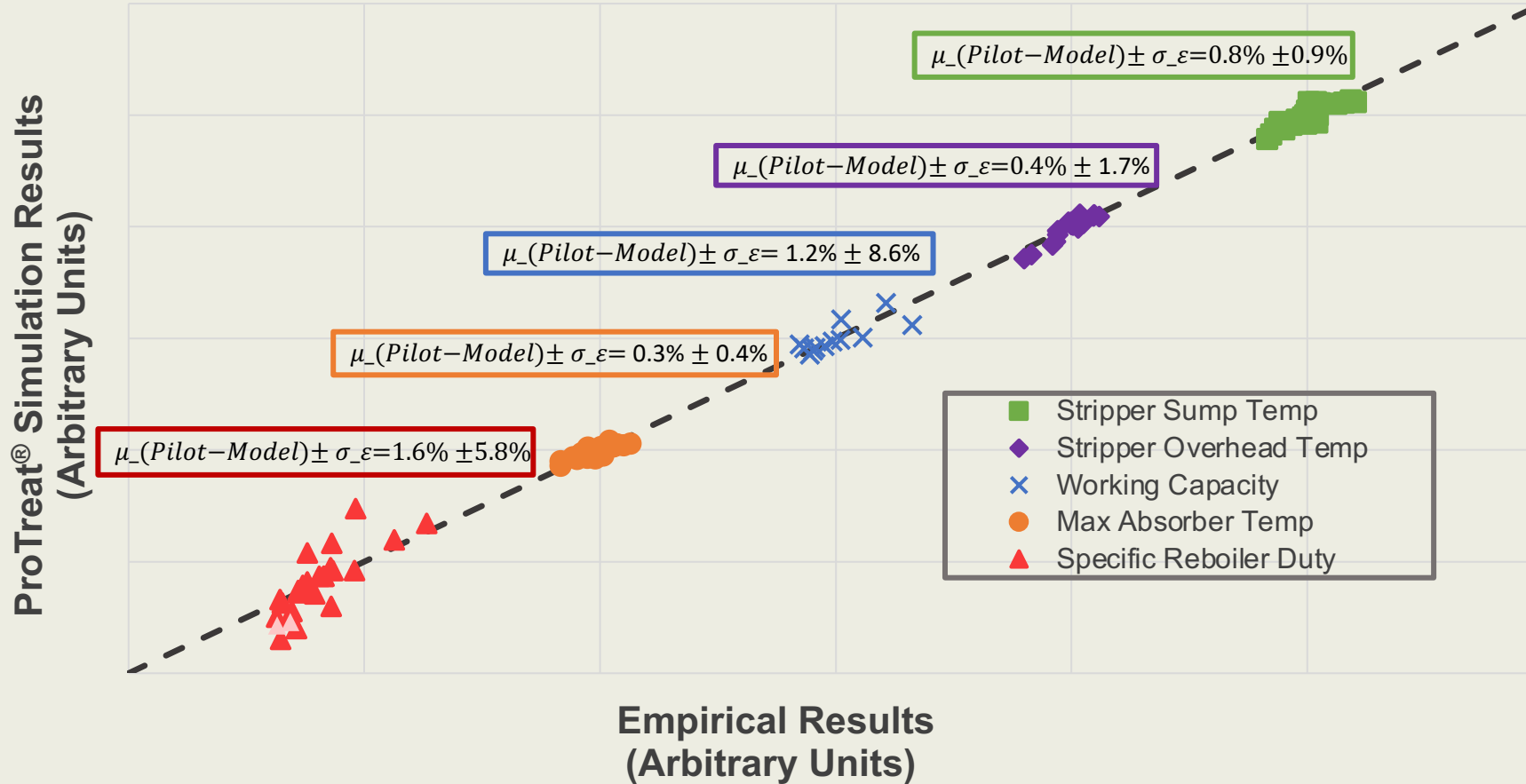
- Key evaluation for further scale-up to major demonstrations
- De-risk perceived scale-up hurdles

DEMONSTRATE THE POTENTIAL OF ADVANCED SOLVENT SYSTEMS AT THE WORLD'S LARGEST & BEST-EQUIPPED RESEARCH FACILITY

- Baseline ICE-31 drop-in solvent at TCM
- Optimize energy consumption and flow rates with a drop-in solvent
- Deep decarbonization at >99% CO₂ capture efficiency
- Validate ION process simulation model
- Assess long-term solvent stability

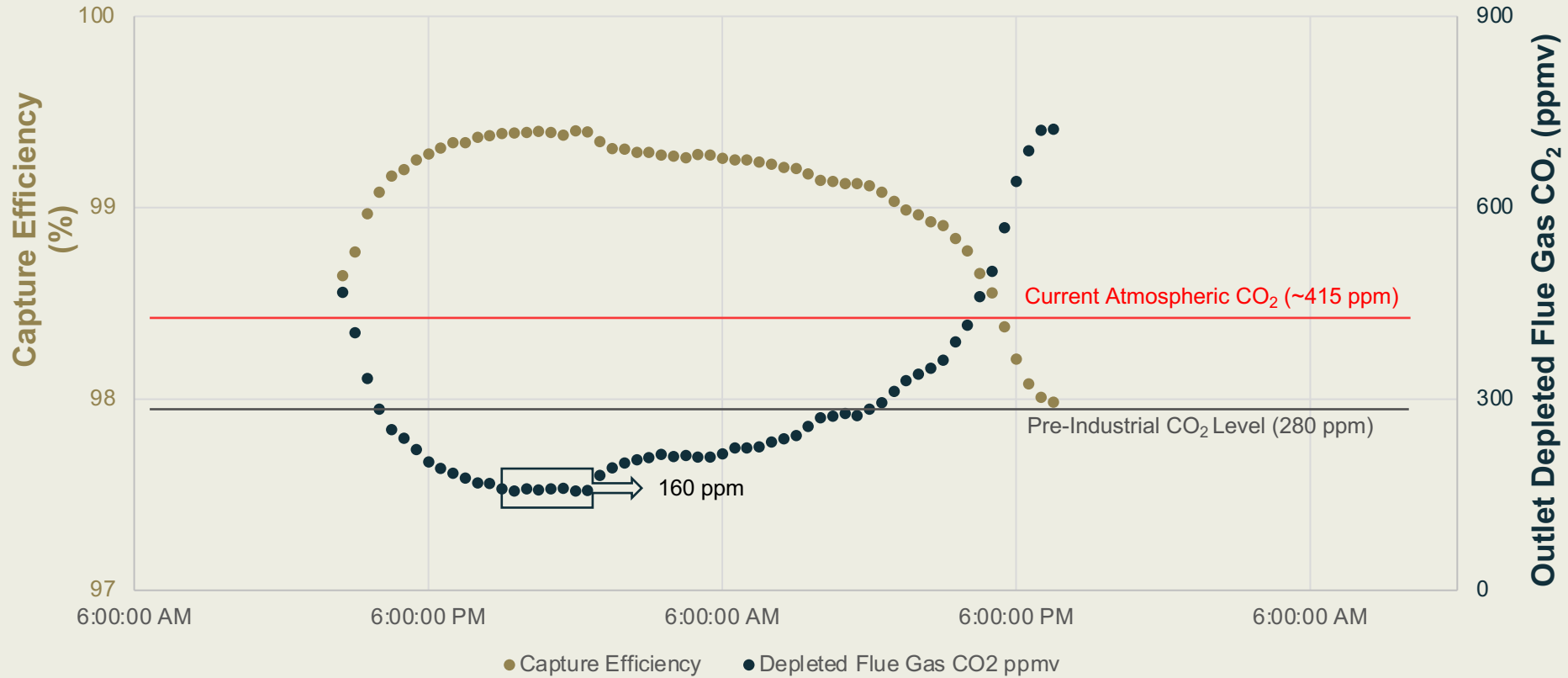


REVALIDATING PROCESS SIMULATION MODEL: PARITY PLOT



DEEP DECARBONIZATION

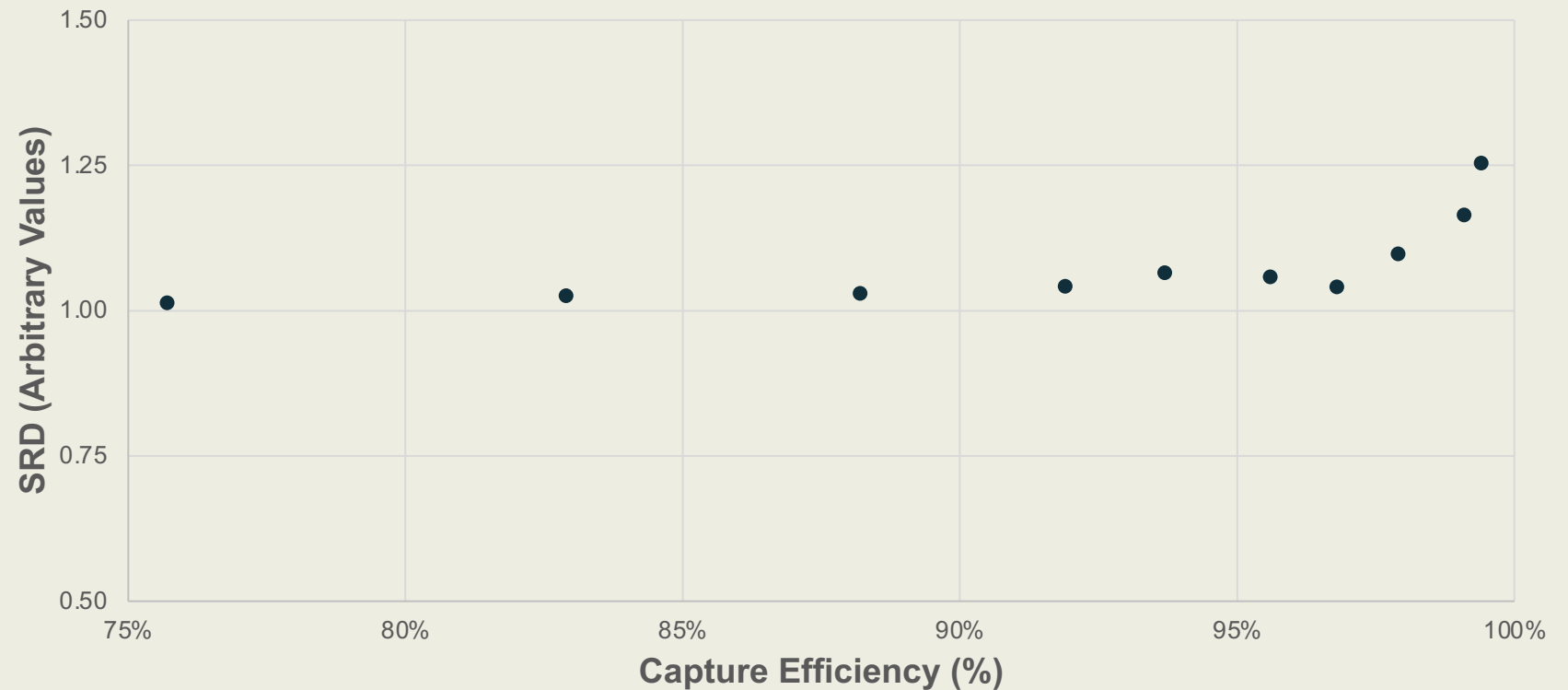
BELOW PRE-INDUSTRIAL CO₂ LEVEL FOR DEEP DECARBONIZATION



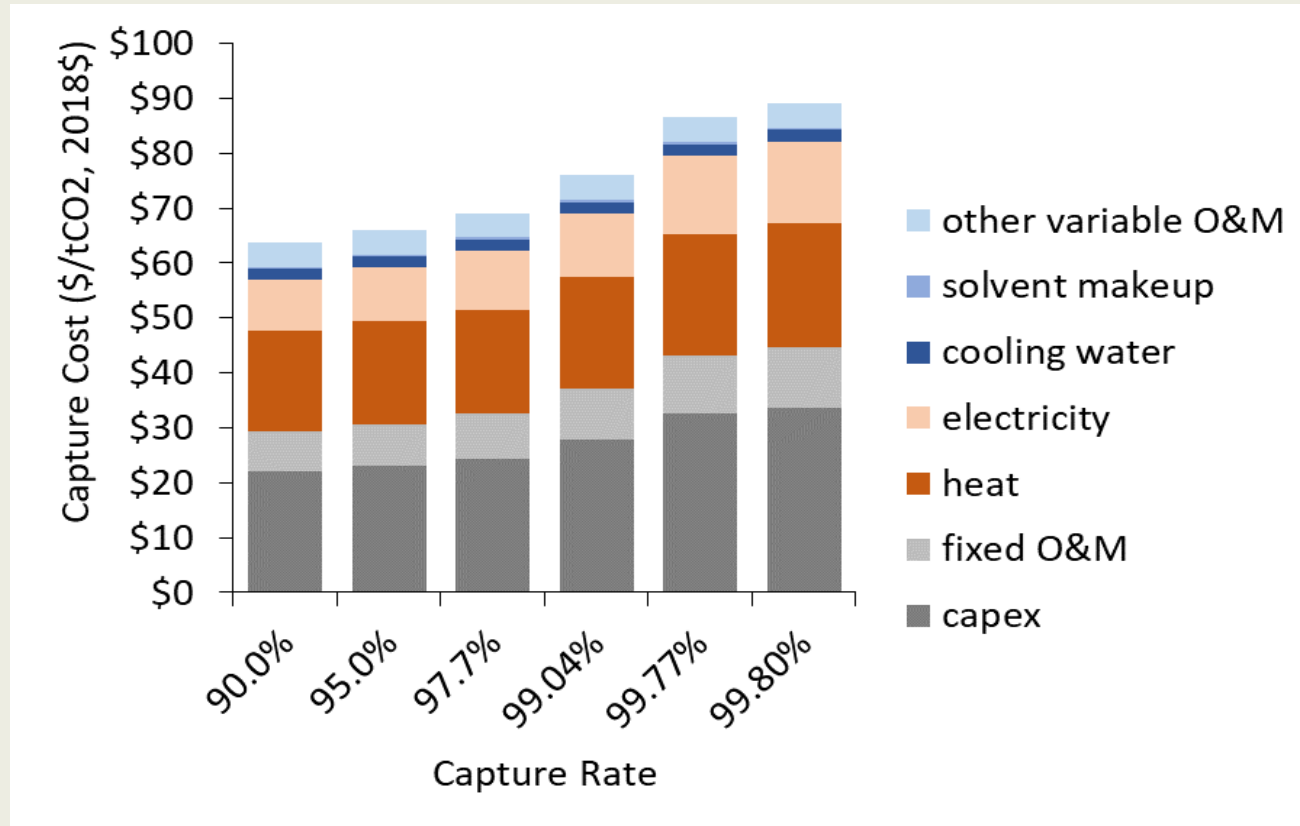
CAPTURE EFFICIENCY SKEW (DROP-IN AT TCM)

SRD SENSITIVITY TO CAPTURE EFFICIENCY

- Minimal additional energy consumption from 76-96% capture efficiency
- Energy penalty associated with deep decarbonization >99% capture efficiency
- Evaluation of techno-economic analysis for deep decarbonization with LLNL



COST ANALYSIS [LLNL FOR MEA]



Source: Wenqin Li, Tom Moore, Mengyao Yuan, Tracie Owens; *High-Rate Post Combustion Capture for Natural Gas Power Plant 2023 FECM Project*; LLNL 2023.

OPEX

- Increase T(str, sump)
- Increase L/G
- Decrease gas flow rate
- Increase STR pressure

CAPEX

- Extra packing height

Future work:

- Evaluation of techno-economic analysis for deep decarbonization with advanced CO₂ capture systems
- Same with ION's ICE-31





THANK YOU



U.S. DEPARTMENT OF
ENERGY

