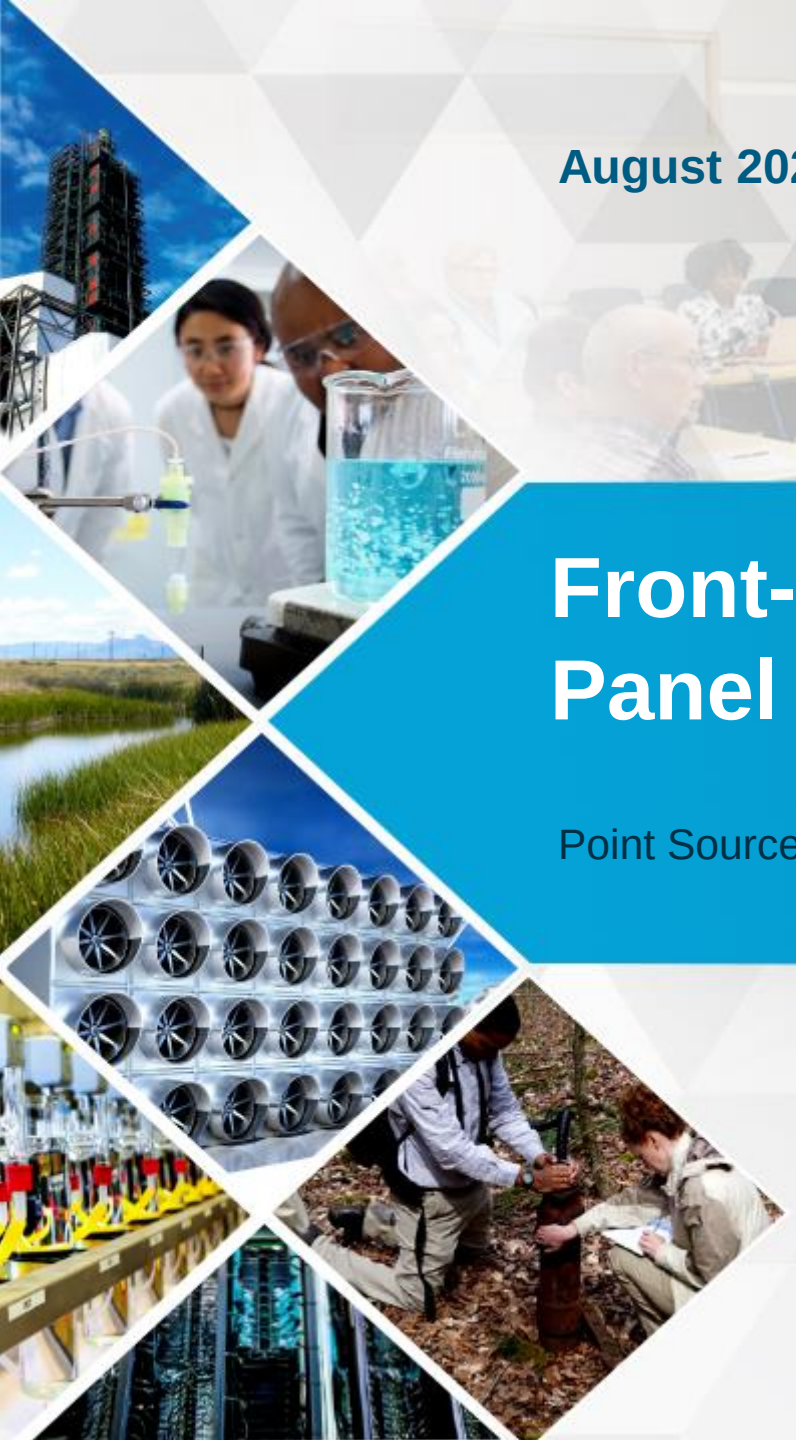


August 2024

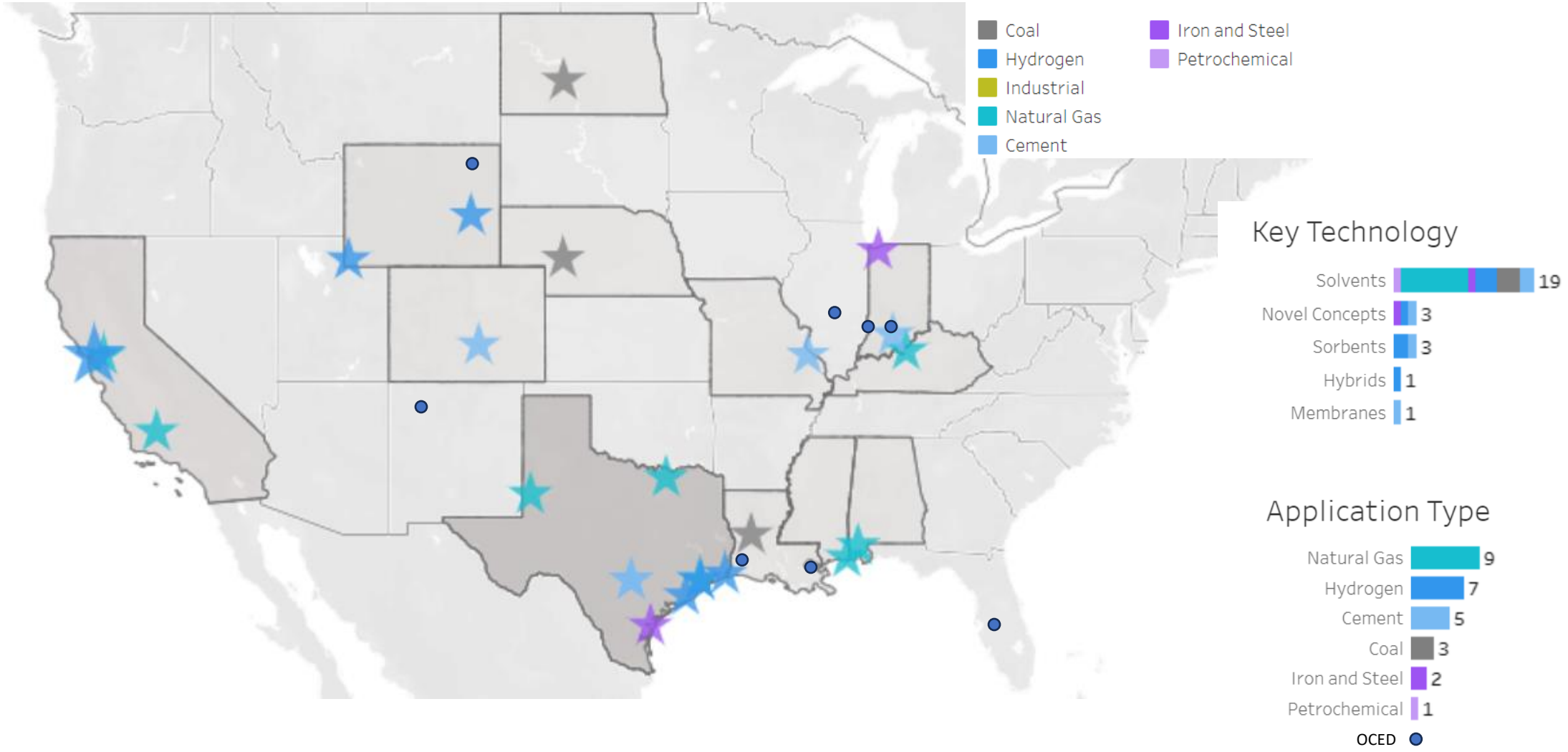
Front-End Engineering and Design (FEED) Panel

Point Source Capture

U.S. DEPARTMENT OF ENERGY

Fossil Energy and Carbon Management

FECM/OCED FEED and pre-FEED Host Sites



Brian Faga – Sargent & Lundy

- Senior Manager in Energy and Industrial Group
- 18 years as Mechanical Engineer and Project Manager
- Worked on early FEED stages of Petra Nova
- Been involved in multiple CCS FEEDS and TEAs
- Solid Fuel and Natural Gas Combined Cycle Power Projects

BOB SLETTEHAUGH – KIEWIT

DOE KIEWIT EXPERIENCE

	PROJECT NAME	DELIVERY METHOD
1	Petra Nova Carbon Capture Demo Project	Design-Build / EPC
2	Chevron – Svante Carbon Capture Pilot Plant	Design-Build / EPC
3	Climeworks DAC Pilot	Design-Build / EPC
4	Carmeuse Lime Kiln Oxyfuel BiCRS	Design Only/ Engineering Services
5	Linde/Svante SMR	Design Only/ Engineering Services
6	ION Calpine Delta NGCC Owner's Engineer	FEED Study
7	Polk Power Station Integrated CO2 Capture Project	FEED Study
8	Retrofittable Advanced Combined-Cycle Integration for Flexible Decarbonized Generation	FEED Study
9	Industrial Carbon Capture from a Cement Facility Using the Cryocap FG Process	FEED Study
10	21st Century Power Plant FEED	FEED Study
11	Prairie State Generating Station Coal Carbon Capture Project	FEED Study
12	ARI Tulare CarbonSAFE	Design Only/ Engineering Services
13	Climeworks DAC 100,000 TPA Pre-FEED *(Multiple locations)*	Pre-FEED Study
14	LH CO2Ment	Pre-FEED Study
15	Area Direct Air Capture Hub	Pre-FEED Study
16	Entergy Lake Charles	FEED Study

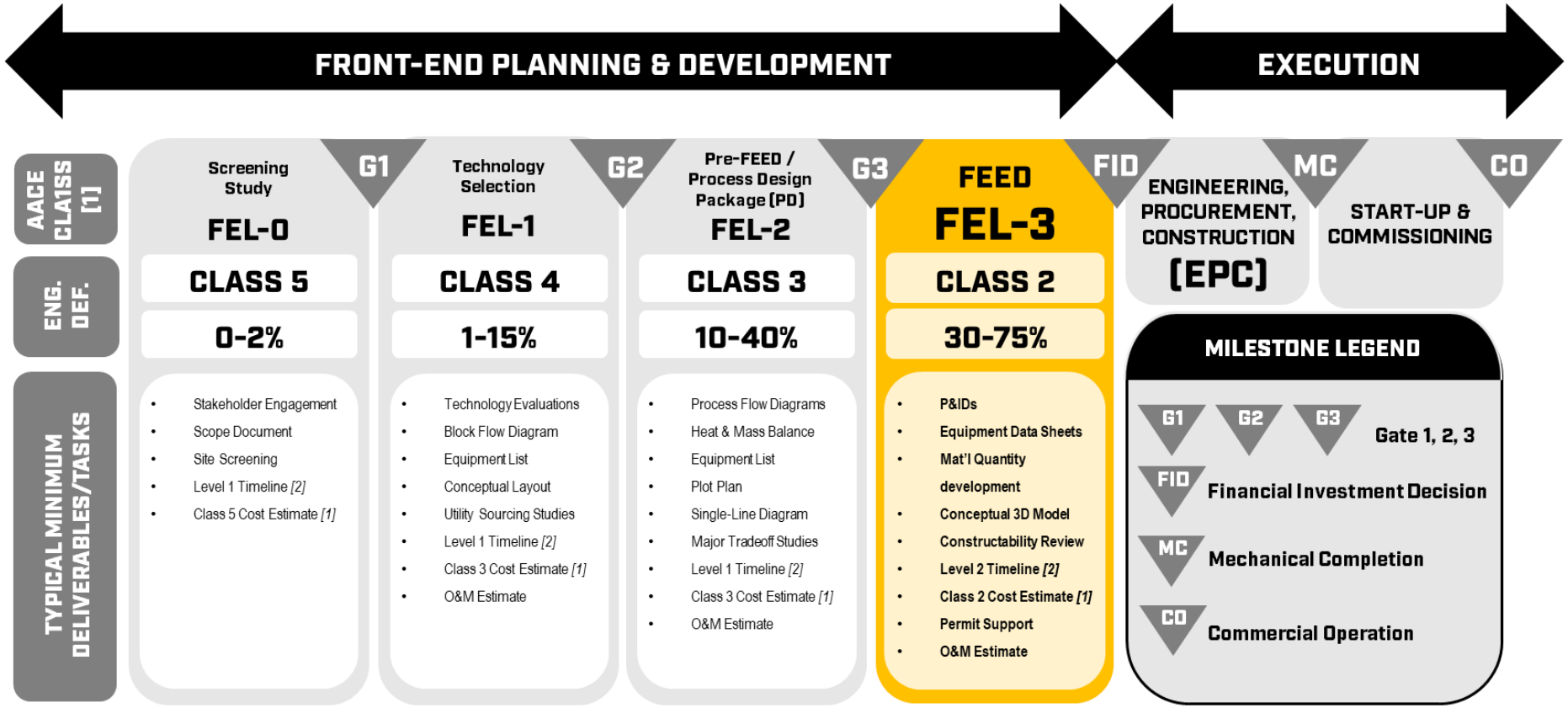
Tim Fout – DOE FECM

- Program Manager with Point Source Capture at office of Fossil Energy and Carbon Management
- Prior to DOE, 20 years working on CCS at NETL
- Focus primarily on CCS FEEDS, TEA and LCA

(Brian) – What are we hoping to get out of FEEDs?

- Design Validation and Project Performance
- Scope of Work Definition
- Cost Definition
- Schedule
- Project Partners and Responsibilities
- Commercial Goals
- Early Permitting Milestones
- Long Lead Supply Chain Considerations
- Constructability Planning
- Risk Identification and Mitigation Strategies
- Project Economic and Social Impacts

WHAT DISTINGUISHES A GOOD FEED?



[1] Refer to AACE International Recommended Practice No. 18R-97: Cost Estimate Classification System
[2] Refer to AACE International Recommended Practice No. 27R-03: Schedule Classification System

INPUTS

- Design Basis
- Contracting Strategy
- Team Structure

OUTPUTS/GOALS

- Support FID
  - Cost Accuracy
  - Project Timeline
- Minimize Project Risk

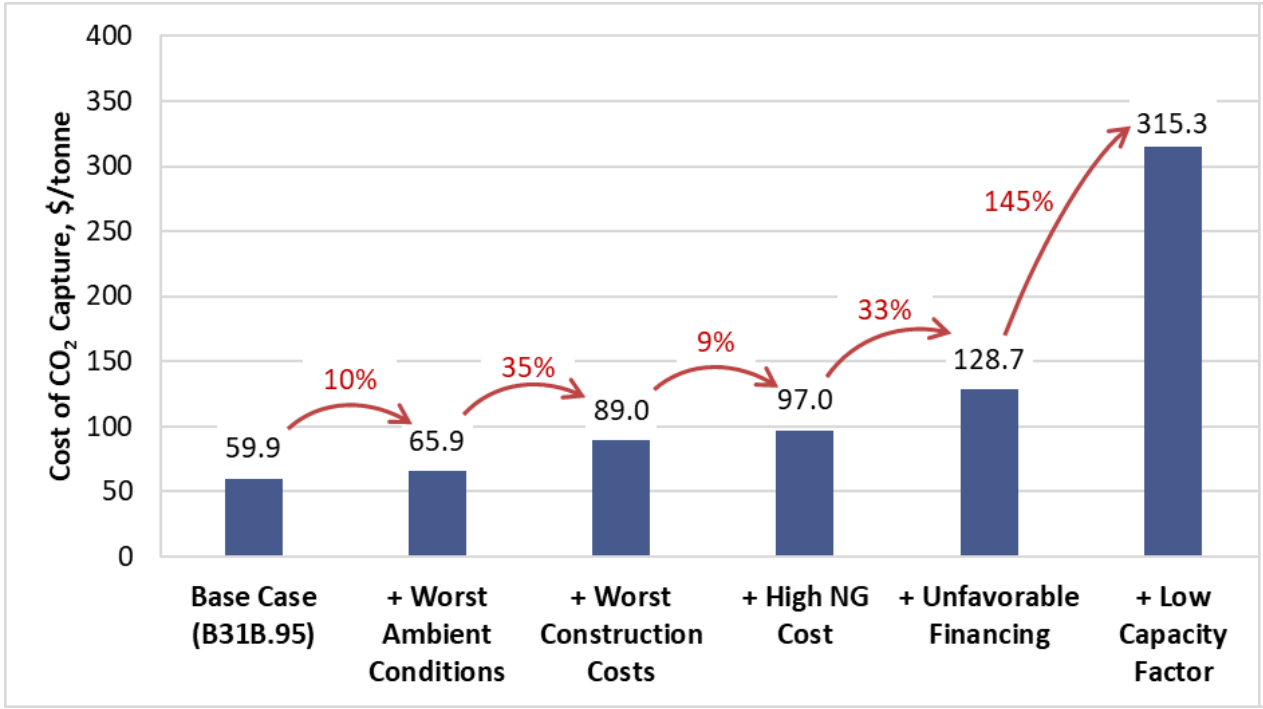
KIEWIT EPC
APPROACH TO FEED

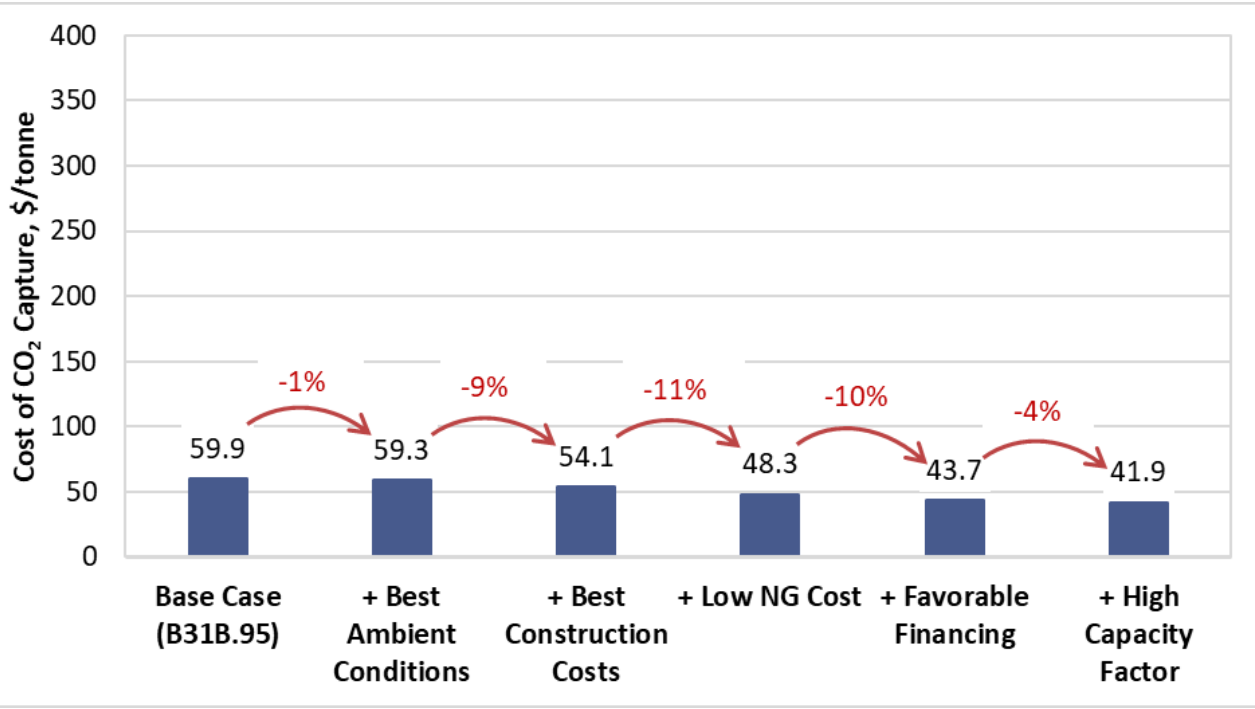
Important Considerations

Techno-economic Analysis (TEA) • Assess progress toward meeting goals • Identify barriers • Recommend options or focus areas • Utilize sensitivities to determine important factors for R&D	**FEED** • Specific application of technology • Detailed engineering on balance of plant • Reduce risk and uncertainty for project decision
Nth of a kind • “What if” or “what will” estimates • Optimal or goal performance • Eventual commercial costs for materials	**First of a kind** • Over design to ensure operability • Higher contingency factors • Realistic capacity factor • Capture material costs today
General Location • ISO Conditions • Plenty of available space • Standard material and labor costs • “Greenfield”	**Site Specific** • Realistic weather conditions (seasonal considered) • Site layout limitations • Localized costs and regulations • Retrofit

NETL Site Specific Study - Cumulative Cases

Cost of Capture





High NG cost:
$7.95 / MMBtu

Base Case NG cost:
$4.42 / MMBtu

Low NG cost:
$2 / MMBtu

Financing is a combination of effects on return on equity, interest rate on debt, debt/equity and effective tax rate

Source: NETL