



ZACHRY GROUP

# OUR PURPOSE IN PRACTICE

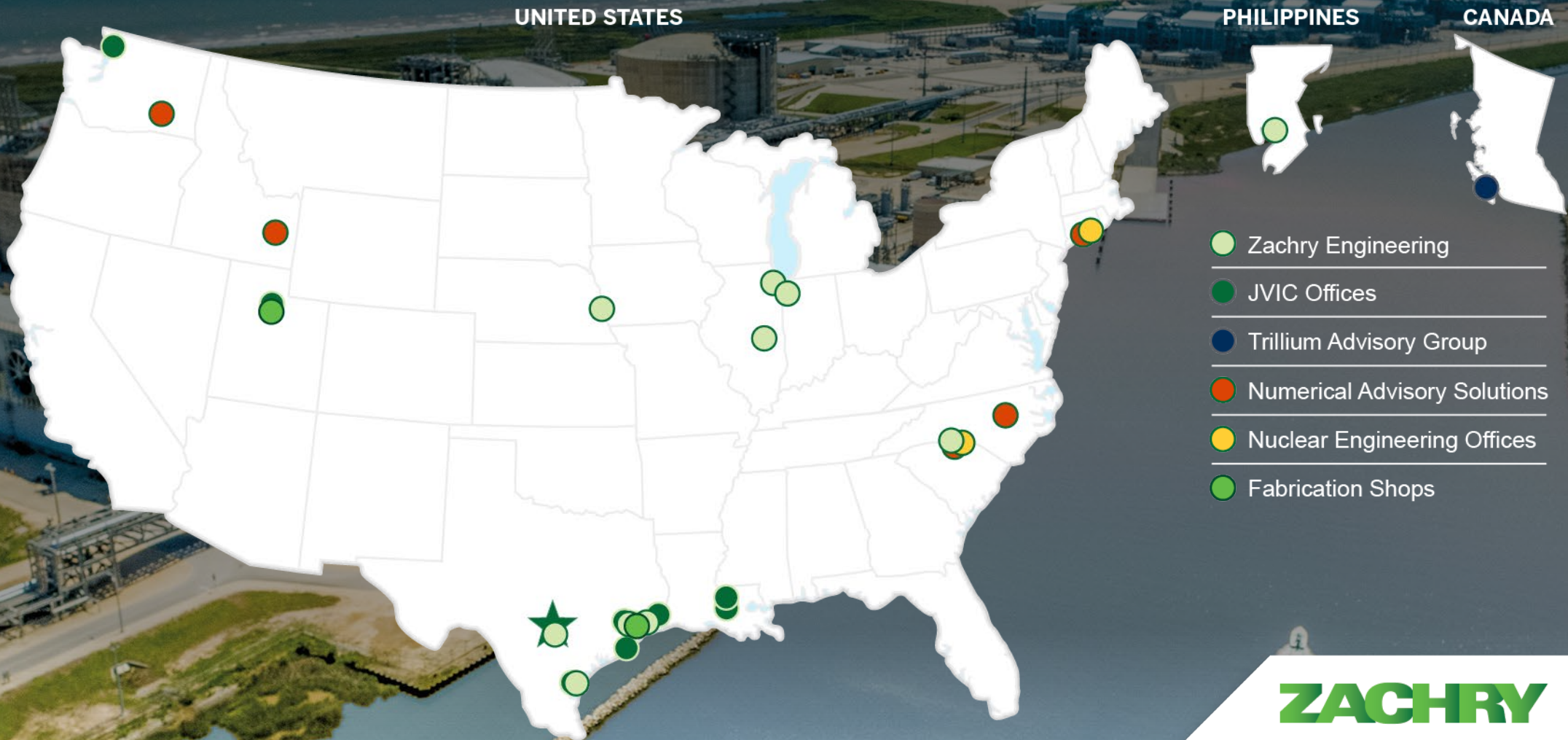
Michael Kotara, President, Zachry Sustainability Solutions LLC

SwRI Industrial Process Emissions Reduction (IPER) Workshop

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**100** YEARS OF  
**ZACHRY**

# Zachry's Geographic Presence



**ZACHRY**

# Zachry by the Numbers

**77%** CUSTOMERS ARE REPEAT BUSINESS

**10** EMPLOYMENT CENTERS

**5200**  
SPOOLS / MONTH  
PIPE FABRICATION CAPACITY

**75+** MAJOR OUTAGES & TURNAROUNDS  
LAST 5 YEARS

LAST 5 YEARS **215+**  
ENGINEERING CUSTOMERS

**61** CURRENT MAINTENANCE SITES

**62** EPC PROJECTS  
LAST 15 YEARS

**ZACHRY**

# Zachry Sustainability Solutions Focus Areas

## Carbon Capture

### CO<sub>2</sub> Removal from Fuel/Flue Gas

Amine  
Chilled Ammonia  
Cryogenic

### CO<sub>2</sub> Removal from Air

Direct Air Capture

### CO<sub>2</sub> Sequestration

Dehydration  
Compression  
Supercritical CO<sub>2</sub>

## Hydrogen / Ammonia

### Electrolysis

Green Hydrogen

### Methane Reforming

SMR / ATR

### Hydrogen Handling

Liquefaction  
Transportation  
Storage

### Ammonia Synthesis

### Water Treatment

## Renewable Fuels & Chemicals

### Renewable Feedstock

Oils, fats  
Carbohydrates, etc.

### Renewable Fuels

SAF, Renewable Diesel, Low Carbon Ethanol, RNG/SNG

### Renewable Chemicals

### Renewable Consumer Goods and Products

## Nuclear Energy

### Small Modular Reactors (SMRs) for Power and Process Heat

X-energy – Xe-100

Natura – MSRR

GEH – BWRX300

## Electrification & Energy Storage

### Gas-Fired Power

Simple Cycle (CT/RICE)

Combined Cycle (CTG/STG)

NET Power Cycle (Allam-Fetvedt Cycle)

### Long Duration Energy Storage

Compressed or Liquefied Air

Chemical Flow Batteries

PHES / Thermal Storage

# Key Active Energy Transition Projects

## Carbon Capture

**Calpine Baytown Carbon Capture Project**

**Technology**

- Shell Cansolv

**Carbon Capture Capacity**  
2.4 MTPA

## Hydrogen / Ammonia

**Multiple Blue Ammonia Projects**

**Technologies**

- Topsoe (4)
- Uhde (1)
- KBR (1)

**Range of Capacities**  
1 – 2 MTPA

## Renewable Fuels & Chemicals

**LanzaJet Freedom Pines Sustainable Aviation Fuel (SAF)**

**Technologies**

- LanzaJet ATJ
- Technip E2E Hummingbird

**Capacity**  
10 MGPA

## Nuclear Energy

**DOW Chemical Seadrift SMR**

**Technology**

- X-energy – Xe-100

**Capacity**

4 SMR Units for Process Heat and Power (800MWt / 320 MWe)

## Electrification & Energy Storage

**NET Power Permian Basin Project**

**Technology**

- NET Power (Allam) Cycle

**Capacity**  
285 MWe  
800 KTPA CO<sub>2</sub>

# Current Challenges for Large Industrial Projects

- Common risks for all large industrial projects:
  - Inflation / Higher interest rates / Supply chain constraints
  - Concerns about availability of adequate skilled Workforce
- Added risks for large Energy Transition projects:
  - CO<sub>2</sub> permanent sequestration – Class VI injection well permitting
  - New technology and/or significantly larger scale for existing technology adds significant project execution risk
  - Government incentives → Labor and procurement requirements → Added cost and extend schedules
    - U.S. Inflation Reduction Act – Prevailing Wages and Apprenticeship requirements
    - U.S. Dept. of Energy (DOE) Grants – Buy America/Build America, Cargo Preference Act, etc.
- Many new uncertainties → Greater difficulty to price “Lump Sum” EPC work
  - Developers typically use project-based financing and want Lump Sum EPC
  - Balance sheet financing has significant advantage in the current market

Michael Kotara  
President, Zachry Sustainability Solutions LLC  
Email: [KotaraM@ZachryGroup.com](mailto:KotaraM@ZachryGroup.com)  
Phone: 210-827-9665