BIO

Education

- Graduated from Texas A&M University-Kingsville in 1998 with MS in Chemical Engineering

Work Experience

- 15 years of Oil & Gas related experience working as Process Engineer, Plant Engineer, Facilities Engineering Advisor and Project manager.
- Area of expertise include Plant Operations, Facilities Design, Trouble shooting, Turnaround and Facilities Project Execution.
- 12 years of CO_2 Flood (Enhanced Recovery) related projects & operations in Texas and New Mexico.

Professional Affiliations:

- Former Member of AIChE - American Institute of Chemical Engineers
- Certification of Engineer in Training (EIT)

Awards

- Received Oxy Worldwide Technology Excellence Award for year 2008

BEFORE THE OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 11
Submitted by: OXY
Hearing Date: May 9, 2013

Facilities Development Process

Design

- Knowledge of Operating environment
- Knowledge of applicable regulatory requirements
- Use of proven Industry Standards (ASME, ANSI, NACE, API)
- Safe design practices (Protection from deviation in operating parameters)

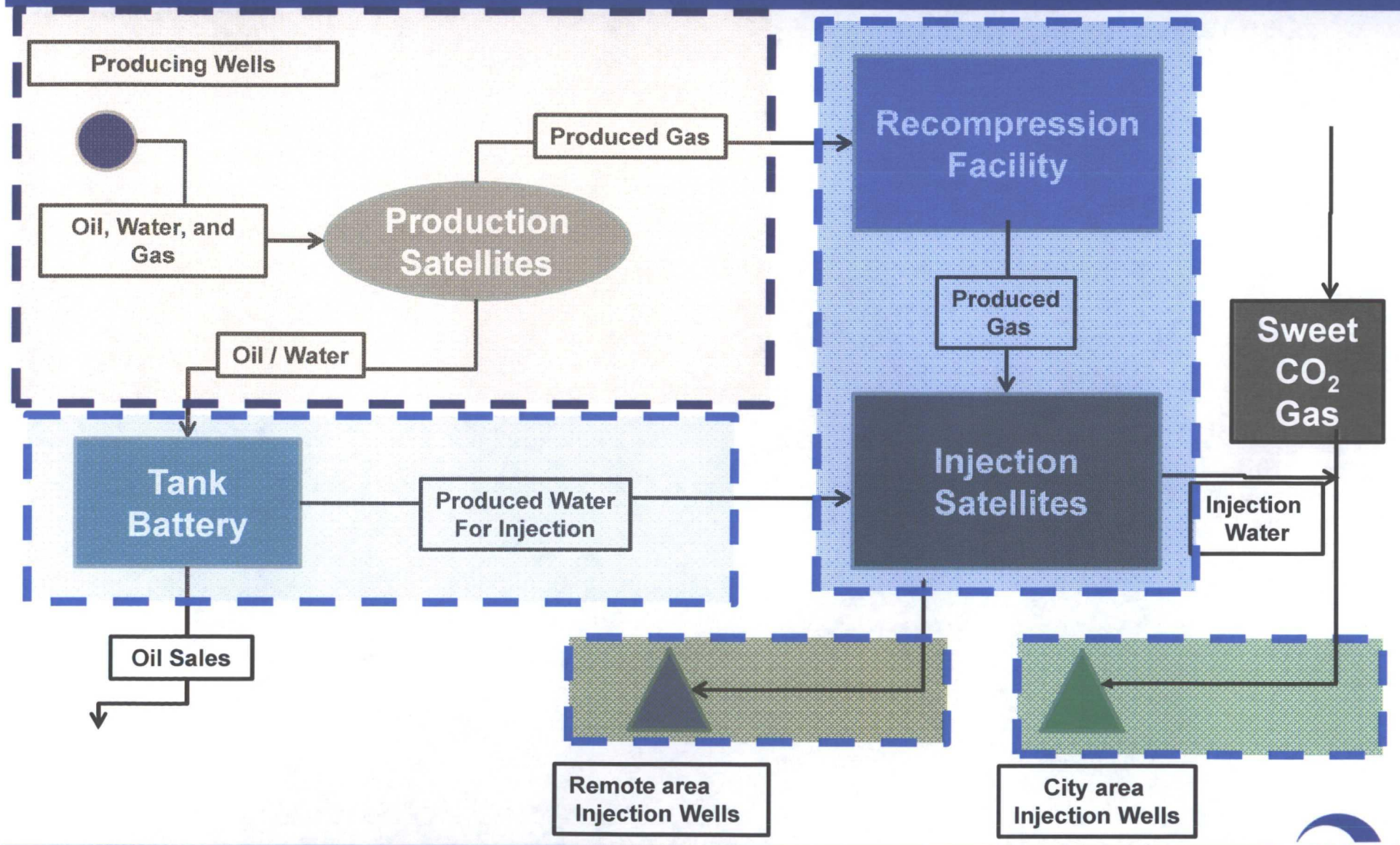
Fabrication & Construction

- Supply chain QA/QC (Vendor qualification, MTR)
- Fabrication QA/QC (PMI Process, NDE Testing)
- Pre Commissioning testing (System Integrity)

Maintenance

- Engineering Controls
- Mechanical Integrity Program

SHU CO_2 Flood (EOR) Flow Diagram



New Mexico Standards

19.15.11.14 STANDARDS FOR EQUIPMENT THAT MAY BE EXPOSED TO HYDROGEN SULFIDE:

"Whenever a well, facility or operation involves a potentially hazardous hydrogen sulfide volume, the person shall select equipment with consideration for both the hydrogen sulfide working environment and anticipated stresses and shall use NACE Standard MR0175 (latest edition) or some other division-approved standard for selection of metallic equipment or, if applicable, use adequate protection by chemical inhibition or other methods that control or limit hydrogen sulfide's corrosive effects."

Additional Oxy Requirements

Design

ASME Sec VIII Div1, NBIC

API 650, API 12

API 6A

ASME B31.3, ASME B31.4, ASME B31.8

UV stamp

Fabrication

ASME Sec IX, ASME Sec V, AWS

Maintenance

ASME Sec V, API 510, API 570, NB VR, API 653, API 12R

Facilities Design - Standards

Component	New Mexico	Additional Oxy requirements
Pressure Vessels	NACE MR0175	ASME Sec VIII Div1, NBIC ASME Sec IX, ASME Sec V, API 510
Tanks	NACE MR0175	API 650, API 653, API 12, ASME Sec IX, AWS, ASME Sec V
Wellheads	NACE MR0175	API 6A
Piping	NACE MR0175	ASME B31.3 ASME Sec IX, ASME Sec V, API 570
Pipelines	NACE MR0175	ASME B31.4, ASME B31.8, ASME Sec IX, ASME Sec V
Relief Valves	NACE MR0175	ASME V & UV stamps, NB VR

Facilities Design - Operating Conditions

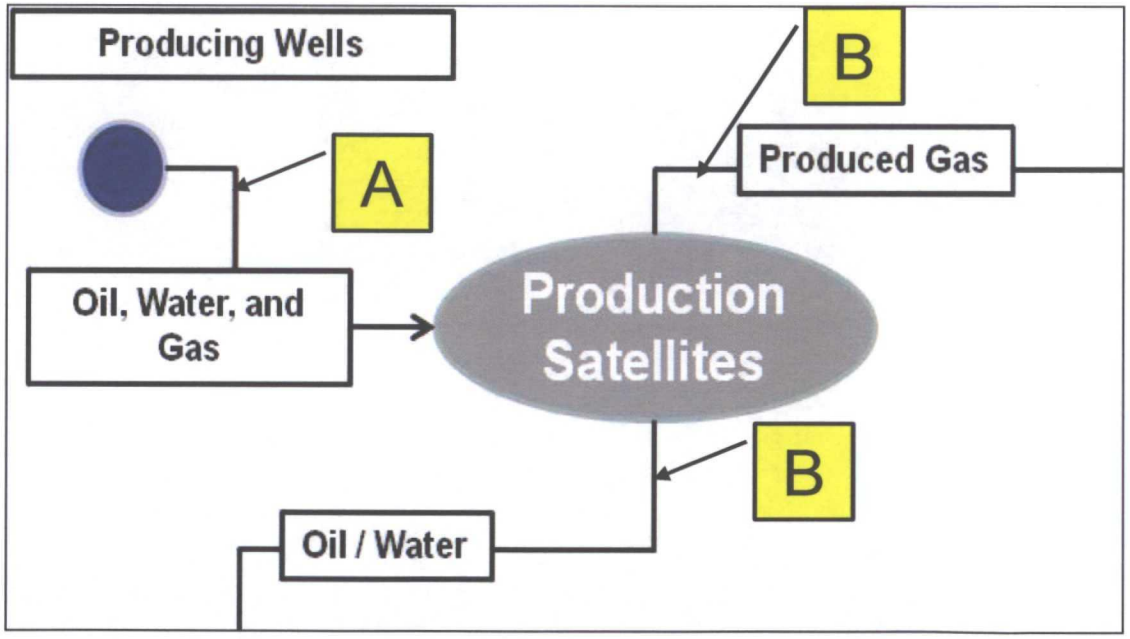
Production system

Pressure:	375 Psig
Temperature:	90 Deg F
Water:	Saturated
H_2S Content:	1.1 Mole%
CO_2 Content:	88 Mole%

Material Selection

A – Internally Coated Carbon Steel

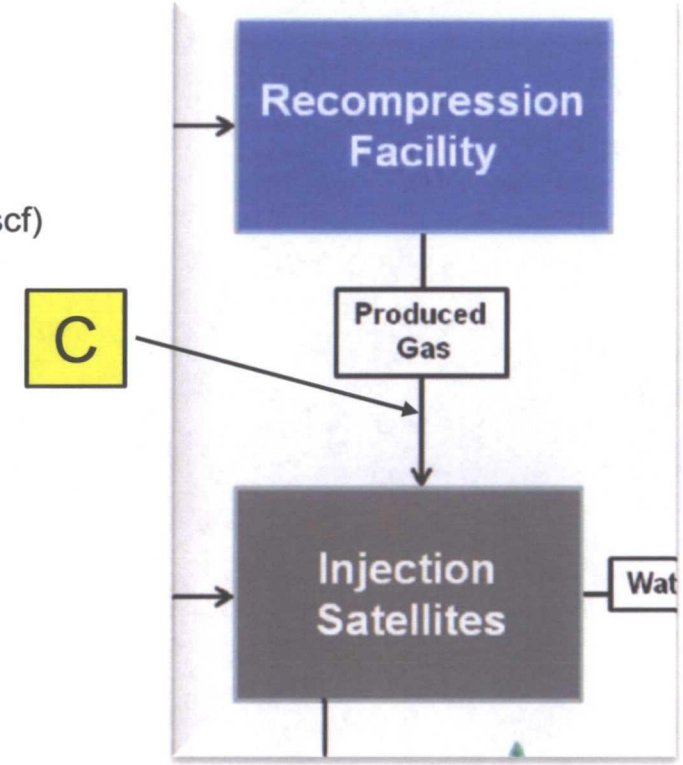
B – Poly Lined Carbon Steel



Facilities Design - Operating Conditions

Produced gas Injection System

Pressure:	1800 Psig
Temperature:	125 Deg F
Water:	Dry Gas (< 7 lb of Water/MMscf)
H_2S Content:	1.1 Mole%
CO_2 Content:	88 Mole%



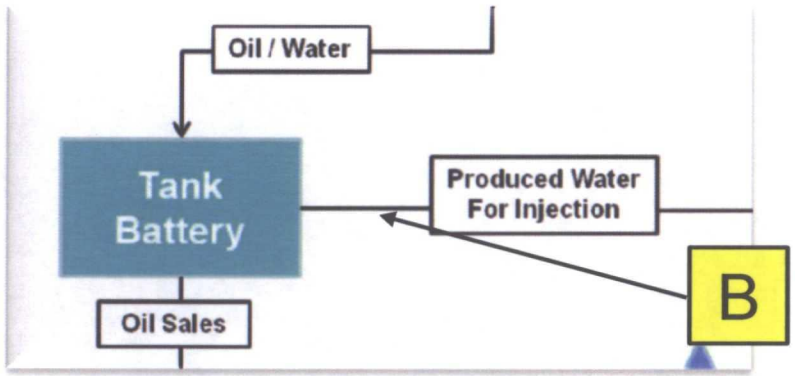
Material Selection

C – Bare Carbon Steel (NACE Compliant)

Facilities Design - Operating Conditions

Produced Water Injection System

Pressure:	1200 Psig
Temperature:	85 Deg F
H_2S:	Trace quantities
CO_2	Trace quantities



Material Selection

B Poly Lined Carbon Steel

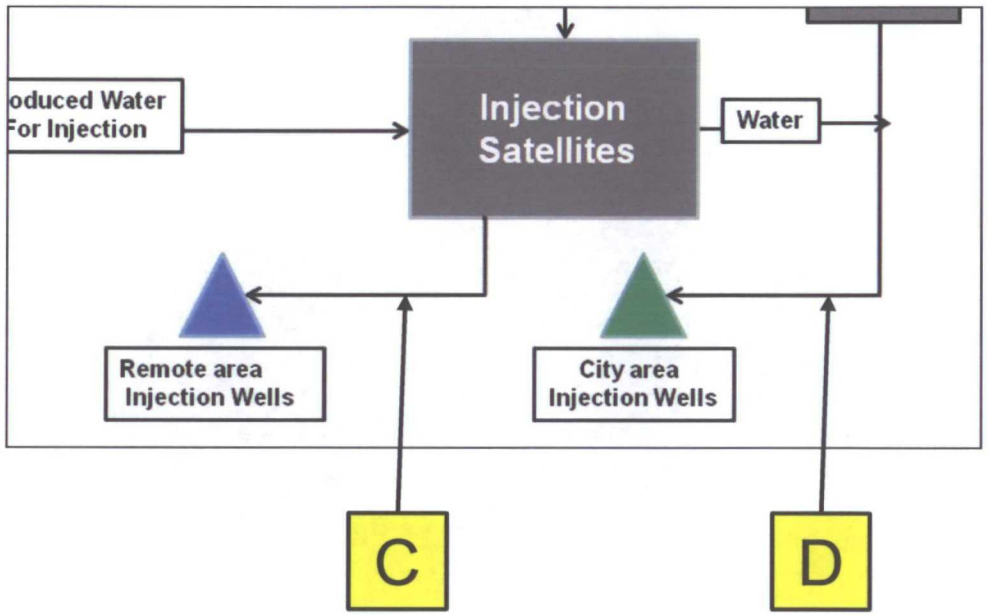
Facilities Design - Operating Conditions

Remote WAG Injection System

Pressure:	1800 Psia
Temperature:	100 Deg F
H_2S Content:	1.1 Mole%
CO_2 Content:	88 Mole%
Water:	Saturated

City Area WAG Injection System

Pressure:	1200 Psia
Temperature:	100 Deg F
H_2S Content:	0 Mole%
CO_2 Content:	99.5 Mole%
Water:	Saturated



Material Selection

C – Poly lined Carbon Steel

D – Stainless Steel

Facilities Design – Corrosion Mitigation Methods

Material Selection

Shown in Previous Exhibits

Cathodic Protection

Sacrificial anode (Zn or Mg plate used in Tanks, Vessels, Exchangers…)

Impressed current (Pipelines)

Engineering Controls

Remove Water from Produced gas

Monitor and mitigate moisture

Integrated shutdown control systems

Monitor and mitigate corrosion using coupons

Fabrication & Construction

Design Implementation, Quality Assurance and Quality Control

Material procurement

- Specification verification/conformance to design
- Supplementary specs
- Special requirement: NACE MR0175

Fabrication

- Welding: ASME IX, NACE MR0175
- Bolting: ASME/ANSI SA 194/NACE MR0175
- Quality Assurance

Construction Acceptance

- Testing
- NDE: ASME Section V, ASNT,
- Data Requirement: ASME, API, NB

Maintenance

Robust Site Specific Mechanical Integrity Programs

Risk Based Inspections focused on damage mechanisms

- Risk Based Inspection technology guided by API 510/580

Regular interval testing and inspections (Internal, External and Ultrasonic Thickness)

- Safety Valve Testing program guided by API 576
- Pressure vessel Inspection guided by API 510
- Process piping Inspection guided by API 570
- Storage tanks Inspection guided by API 653

Record keeping (Data Reports, Drawings, Specifications, Procedures, Inspection records, etc.)

Record keeping

Construction Documentation
Vessel Data Reports
Design Calculations
Mill Test Reports
Vessel Drawings
Hydrotest Records
PWHT Records
NDE Reports
Pictures
Etc.....

Inspection Documentation
Internal Inspection Reports
Re-Rating Documentation
Thickness measurements
Inspection Reports
Alteration Reports
Anomaly Reports
Repair Reports
Repair Plans
Pictures

Dashboard Reporting

Inspection Planning
Examiners
Visual Inspections
Thickness Surveys
API 510 Inspectors
Internal Inspections
Anomaly Inspections