

OCCIDENTAL PETROLEUM CORPORATION: LEADER IN CO₂ EOR & CCUS DEPLOYMENT

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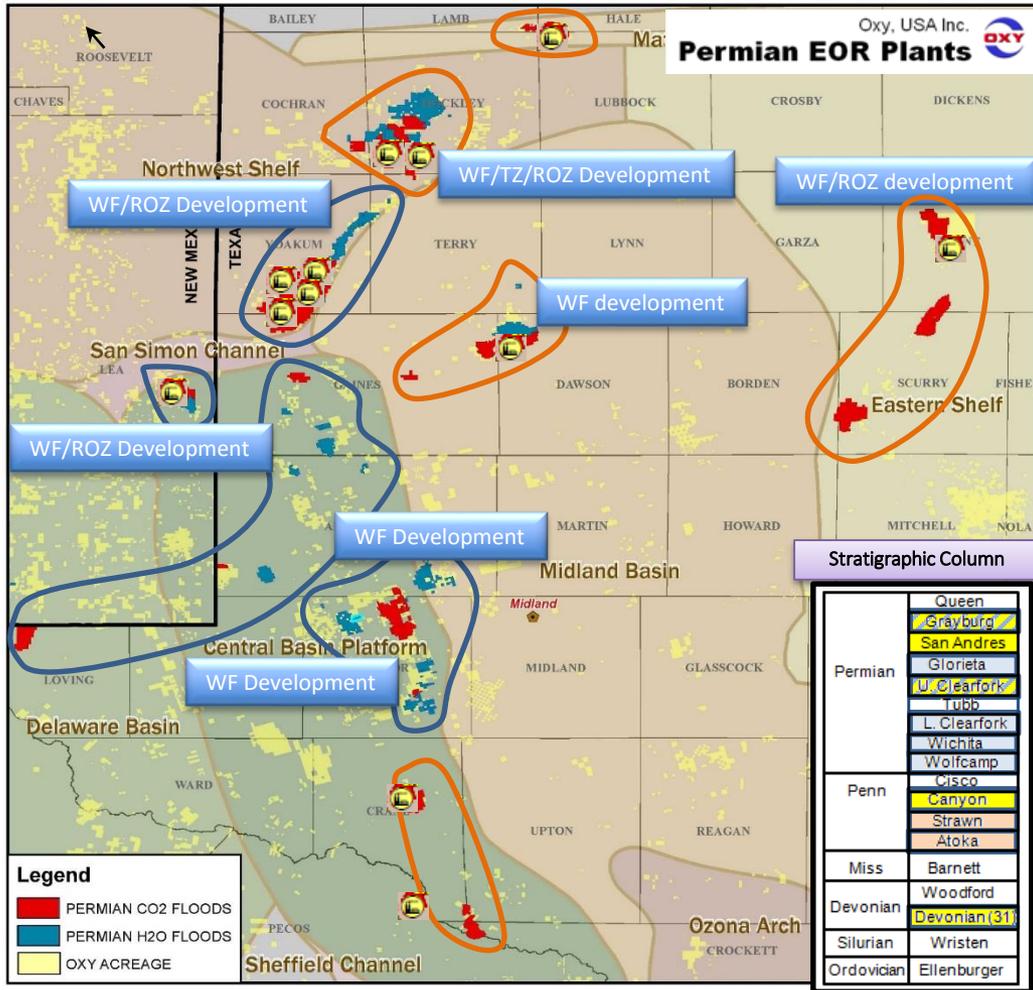


Occidental Petroleum Corporation

Agenda

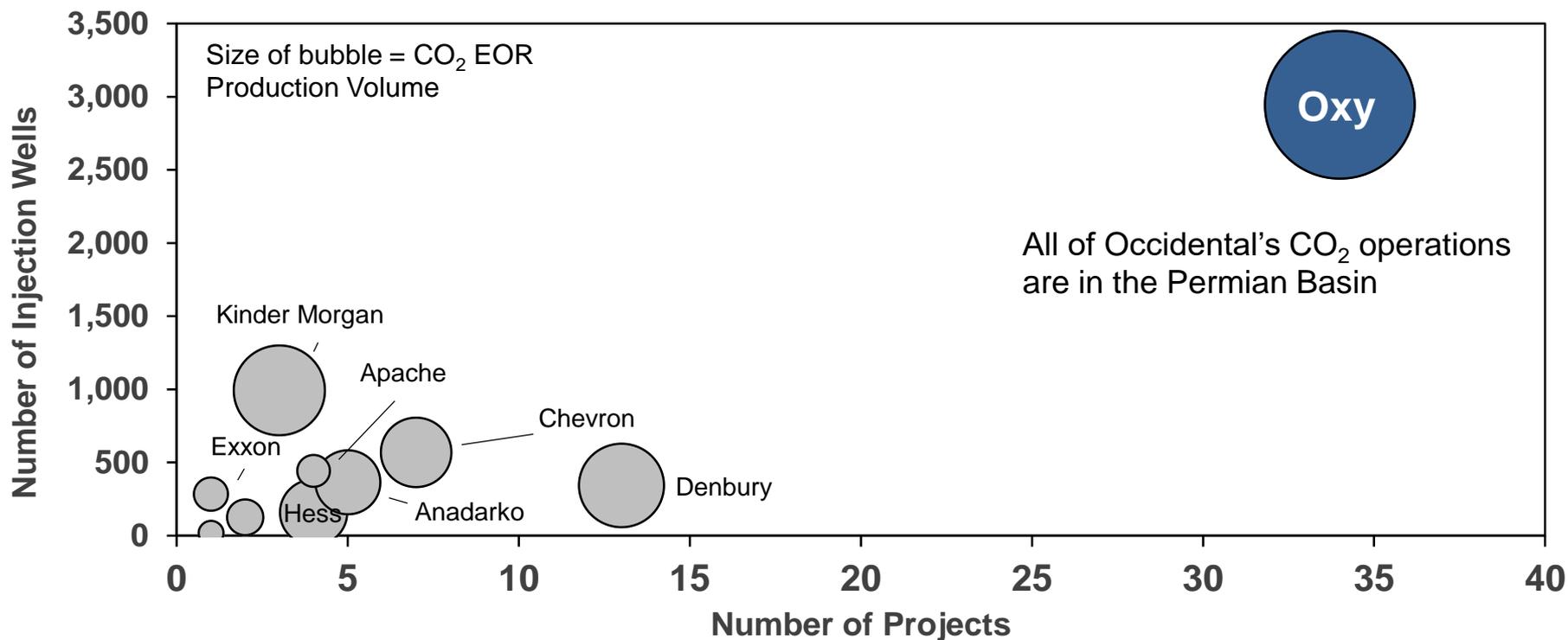
- Occidental Petroleum Permian EOR Operations Overview
- Overview of Federal Injection Requirements
- Occidental MRV Plans
 - Denver Unit
 - Hobbs
- 45Q Tax Credit
- Estimated Value of Potential Incentives on Large CO₂ Pipeline
- Summary

Permian EOR Operations



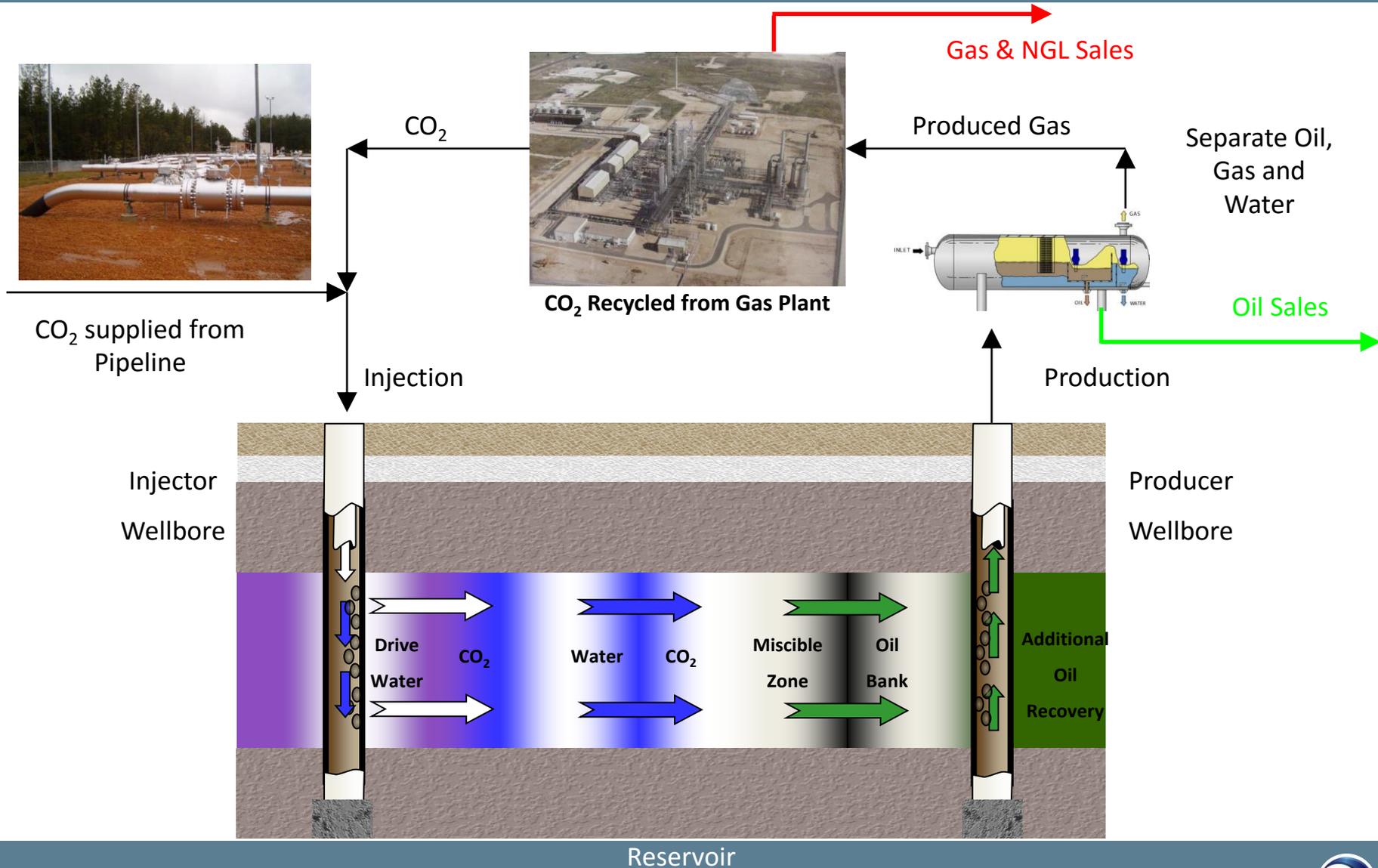
- 31 CO₂ Flood Units
 - ~1/3 of US Miscible Gas EOR Production
- 80 Waterflood Units
- Significant primary development acreage
- 12 Gas Processing Plants
 - 2.3 BCFPD of gas handled (~44 Mtpa)
 - 1.2 BCFPD of CO₂ Recycled (~23 Mtpa)
- 2 CO₂ Source Fields
 - 1.1 BCFPD CO₂ Purchased (~21 Mtpa)

World Leader in CO₂ Enhanced Oil Recovery

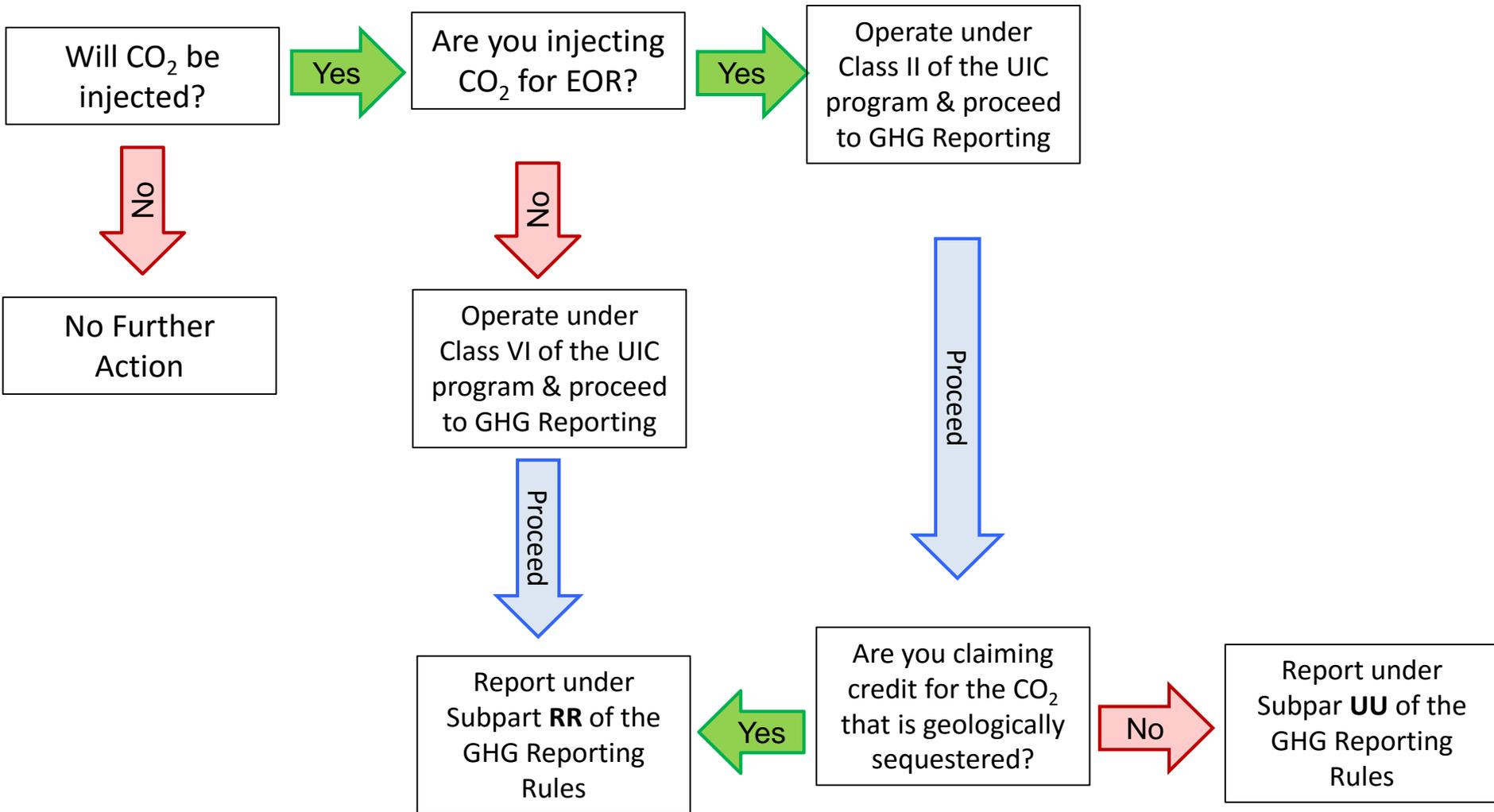


- Occidental is the largest handler of CO₂ in the Permian Basin
 - Injects >2.0 billion cubic feet a day
 - Operates 31 CO₂ EOR projects

CO₂ EOR Process



Federal CO₂ Injection Requirement Flow Chart



Greenhouse Gas Reporting Program (RR vs. UU)

GHGs to be Reported



X denotes if a GHG must be reported under either subpart UU, RR, or both

	GHGs to be Reported	Subpart RR	Subpart UU
1	Mass of CO ₂ received	X	X
2	Mass of CO ₂ injected into the subsurface	X	
3	Mass of CO ₂ produced	X	
4	Mass of CO ₂ emitted by surface leakage	X	
5	Mass of CO ₂ equipment leakage and vented CO ₂ emissions from surface equipment located between the injection flow meter and the injection wellhead	X	
6	Mass of CO ₂ equipment leakage and vented CO ₂ emissions from surface equipment located between the production flow meter and the production wellhead	X	
7	Mass of CO ₂ sequestered in subsurface geologic formations	X	
8	Cumulative mass of CO ₂ reported as sequestered in subsurface geologic formations in all years since the facility became subject to reporting requirements under subpart RR	X	

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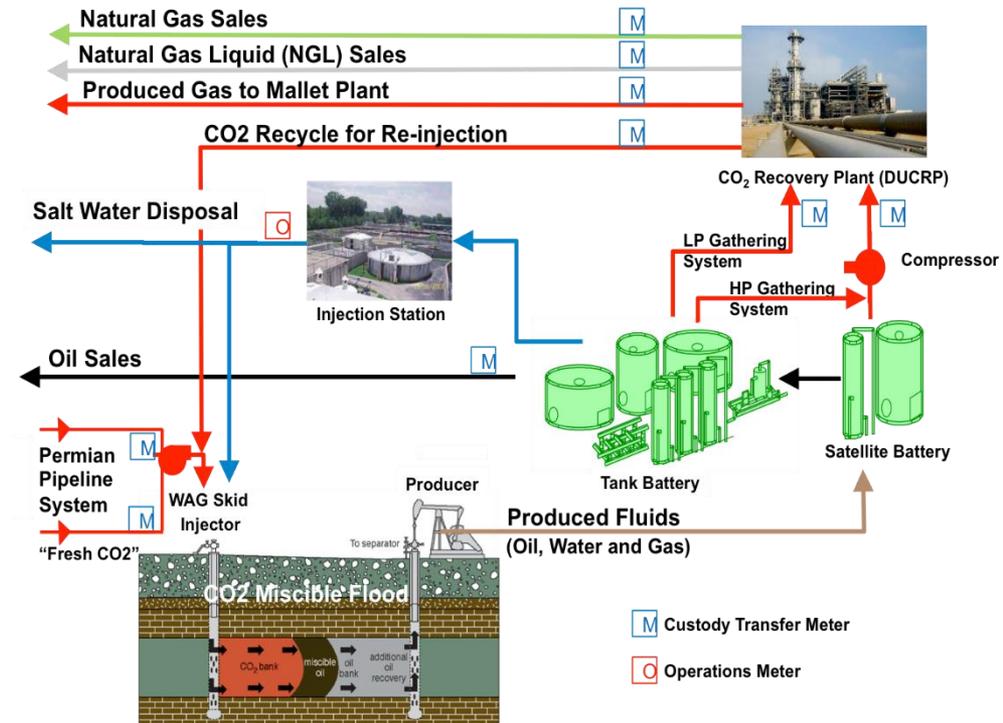
Objective and Drivers for Monitoring, Reporting and Verification (MRV) Plan

- To enable CO₂ capturers to qualify for and receive 45Q Tax Credit
- To lead efforts in CCUS by developing first and subsequent MRV Plans
- Leverage our subsurface knowledge gained through decades of EOR experience and operating history to develop MRV plans that satisfy requirements in EPA's GHG Reporting Program (GHGRP) Subpart RR

Key Elements to MRV Plans

- Suitable geology
- Existing facilities / infrastructure
- Injection operations
- Risk assessment
- Monitoring and control system
- Mass balance calculations

General Production Flow Diagram



Plan Reporting Obligations

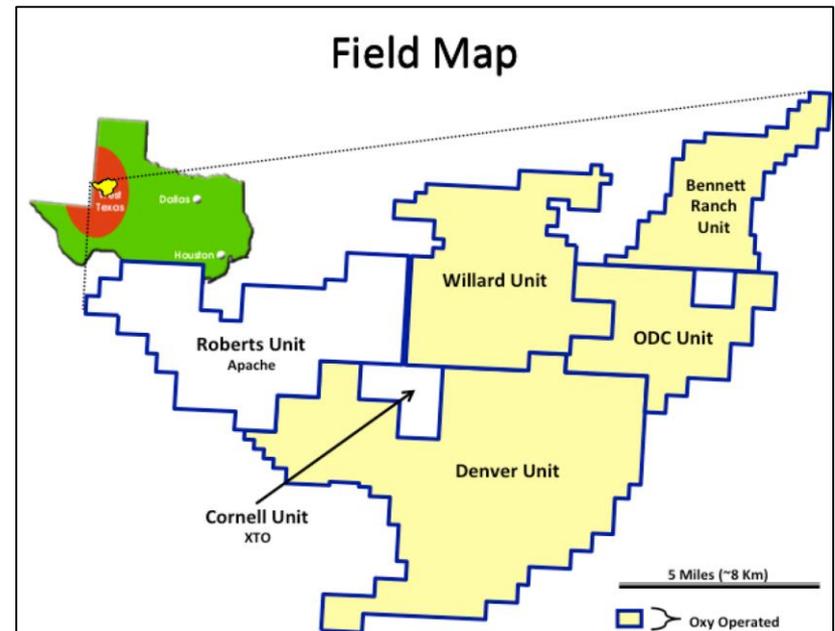
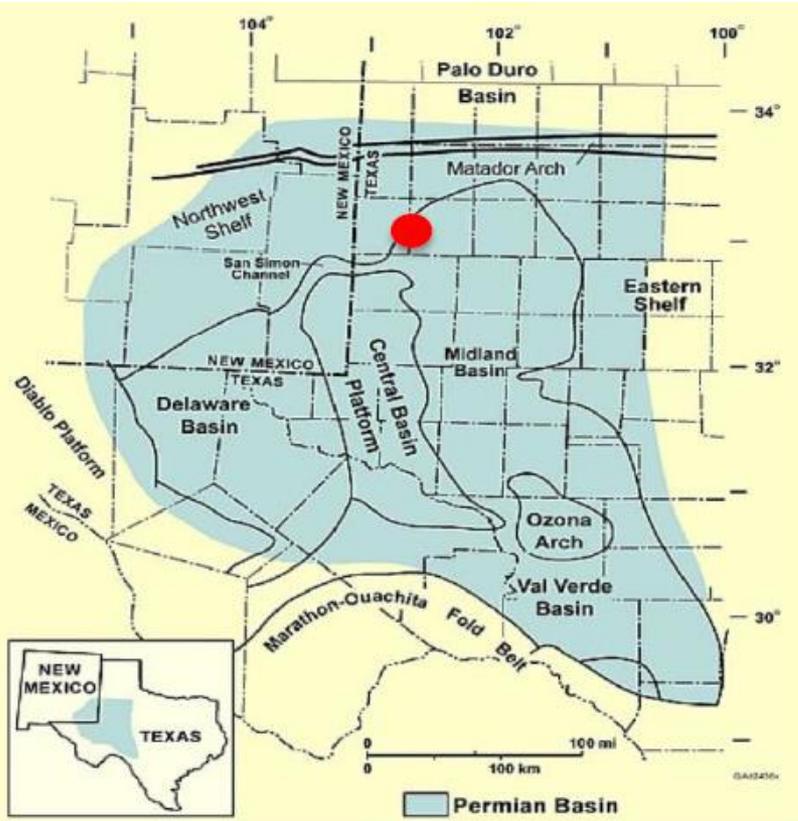
- Report inputs for mass determinations
 - CO₂ received, injected, produced, recovered
 - CO₂ lost to surface leakage, venting and fugitive emissions
- Annually report mass sequestered and cumulatively stored
- Retain records to meet IRS / EPA requirements
- Implement plan within 180 days of EPA approval
- Revise and submit for approval material changes to monitoring or operational parameters within 180 days

Plan Discontinuation

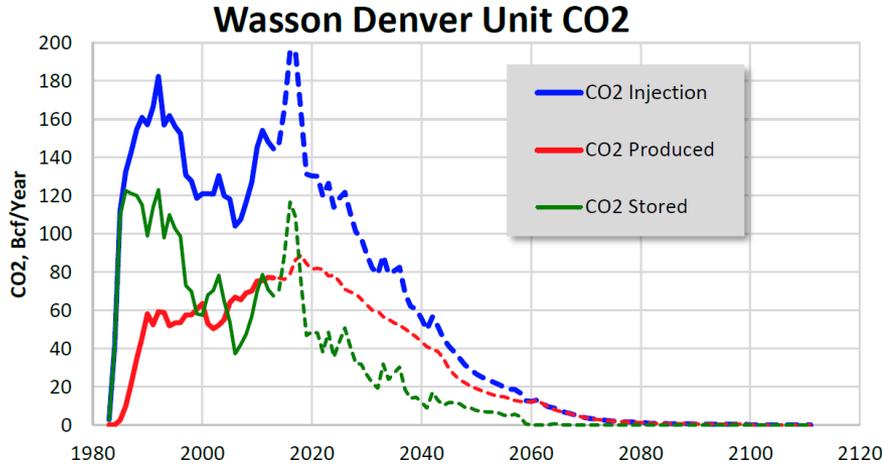
- Consistent with Subpart RR, Occidental may submit a request to discontinue reporting:
 - At the end of the Specified Period
 - Accompanied by a demonstration that the cumulative mass of CO₂ reported as sequestered during the Specified Period is not expected to migrate in the future in a manner likely to result in surface leakage
- It is expected that a demonstration can be made within two to three years after injection for the Specified Period ceases

Denver Unit Project Description

- Subdivision of the Wasson Field located in West Texas
- Established in 1960s to implement water flooding
- CO₂ flooding began in the Denver Unit in 1983



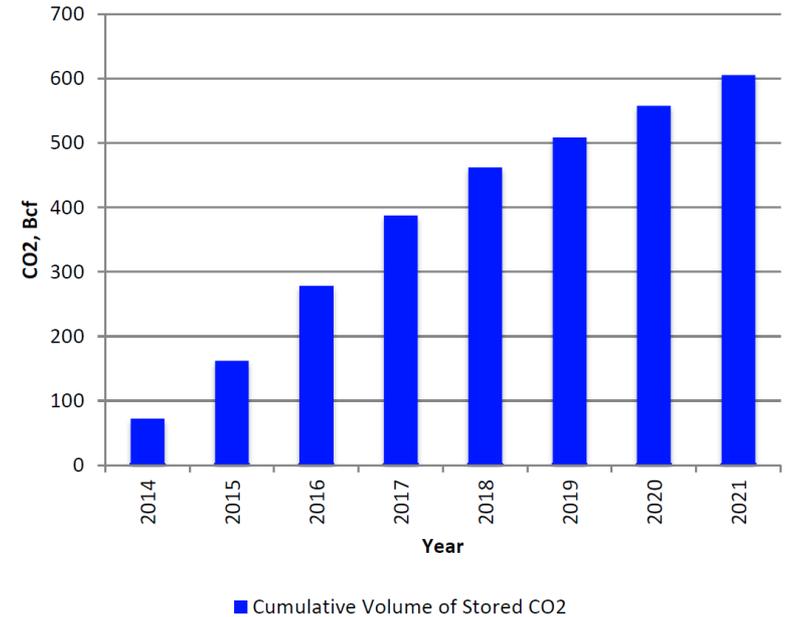
Injection Operations (Denver Unit)



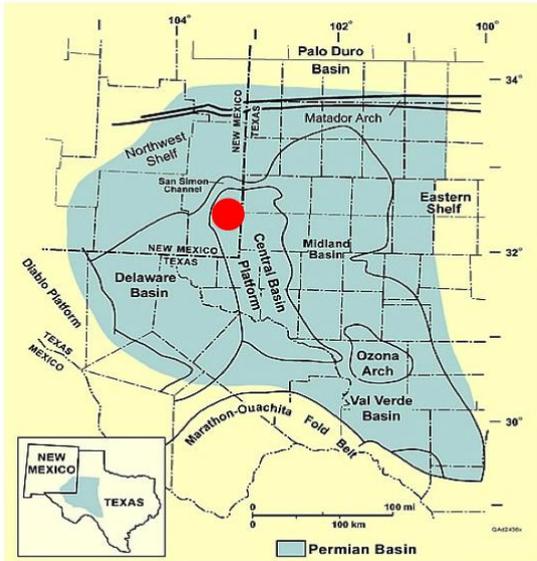
- Projected storage through end of operations of 3,768 Bscf (200 MMMT)

- Historic and forecast CO₂ injection / production / storage
- Occidental designs & operates floods around an IWR of ~1
- Injected total of 4,035 Bscf of CO₂ (213 MMMT) by end of 2013. 84 MMMT) produced and 129 MMMT stored.

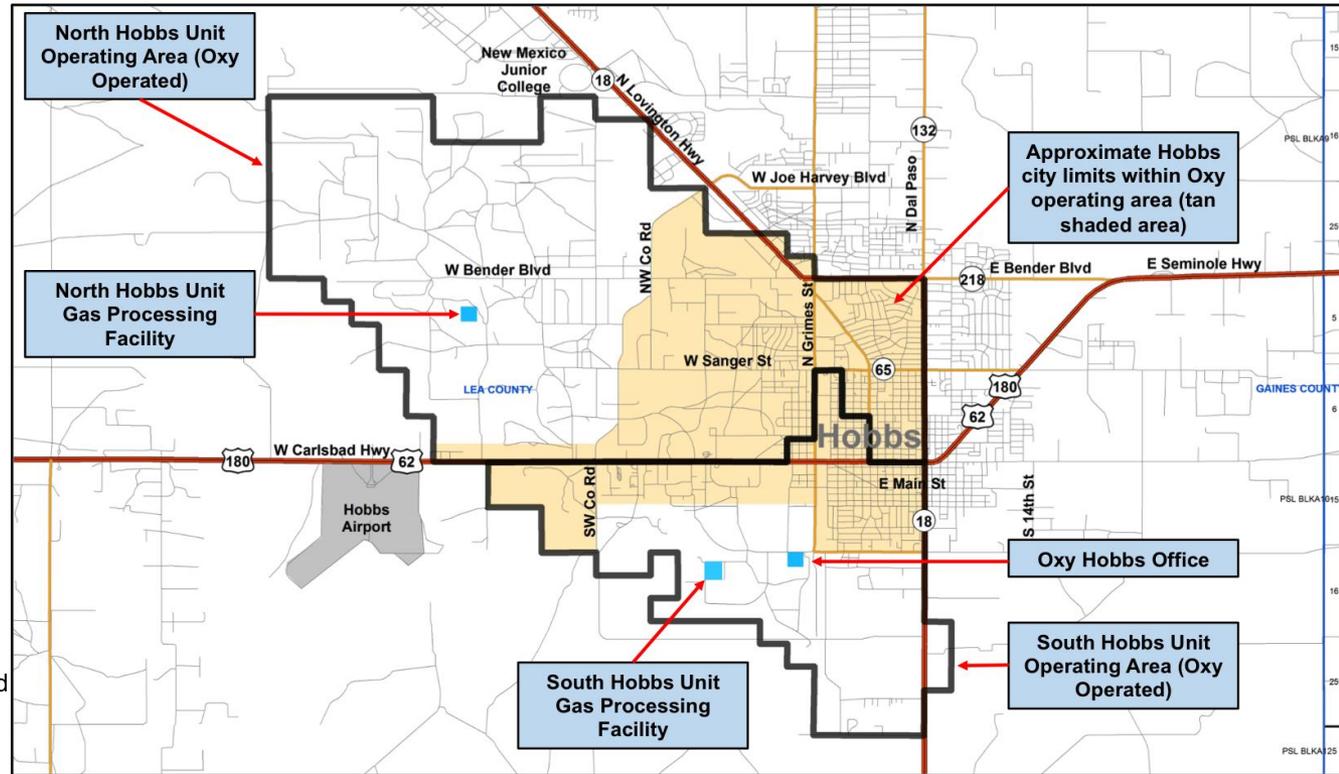
Cumulative Stored CO₂



Hobbs Project Description

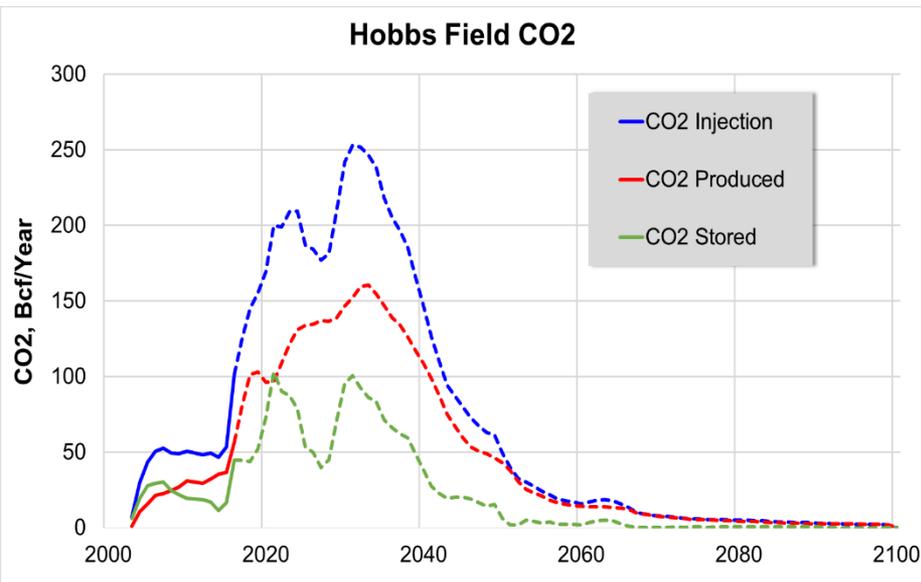


● Approximate location of Hobbs Field

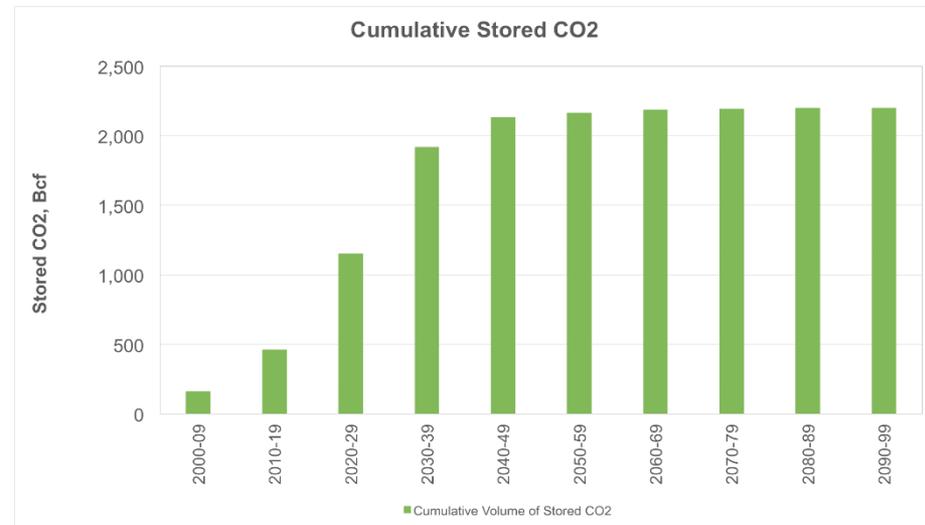


- Discovered in 1928
- NW portion of the Central Basin Platform of Permian Basin
- Hobbs Field = North Hobbs Unit + South Hobbs Unit
- CO₂ Flooding NHU since 2003, SHU since 2015
- Proximity to town = added safeguards in tan area

Injection Operations (Hobbs)



- Projected storage through 2100 of 2,197 Bscf (118.8 MMMT)



- Injected total of 579 Bscf of CO₂ (31.3 MMMT) by end of 2015. 318 Bscf (17.2 MMMT) produced and 261 Bscf (14.1 MMMT) stored.

Hobbs / Denver Unit Comparison

- Similarities
 - Quality of formation and seals
 - Occidental operational procedures / fluid management based on modeling, controls, monitoring, maintenance
 - Conceptual approach to mass balance
- Differences
 - Structural control – Occidental controls all of NHU / SHU
 - Closer proximity to a town resulting in operation, construction, monitoring safeguards
 - CO₂ floods at Hobbs are less mature; will operate longer
 - Hobbs Recompression Facility functions like Denver Unit CO₂ Recovery Plant but less complex
 - Standard pressure in NM is 15.025 psi so conversion factor is larger

2017 45Q Bills

House

The Carbon Capture Act

- **Specifications**

- Keeps existing 45Q threshold in place for current projects
- Credit for EOR and Saline increases to \$35. There is only one credit
- Ramps credit for 10 years
- Reduces 500,000 threshold to 100,000 - Was 150,000
- Includes stronger transferability provision from Senate bill
- Authorizes programs for projects that commence construction within 7 years
- Credit can be claimed for 15 years once placed in service
- Adds language to allow Carbon Monoxide and Air capture to get the credit
- Credit authorization language is changed to allow projects that “have never received 45Q tax credit before” (NRG/Petra Nova)

Senate

The Carbon Capture Utilization & Storage Act

- **Specifications**

- Keeps existing 45Q threshold in place for current projects
- Credit for EOR increases to \$35 and \$50 for saline storage
- Ramps credit over 10 years
- Reduces 500,000 threshold to 100,000 for industrial and 25,000 threshold for non-EOR
- Includes stronger transferability provision
- Authorizes programs for projects that commence construction within 7 years
- Credit can be claimed for 12 years once placed in service
- Provides eligibility for new forms of CO₂ (algae, Biomass, alternative fuels, etc)
- Adds language to allow Carbon Monoxide and Air capture to get the credit
- Credit authorization language is changed to allow projects that “have never received 45Q tax credit before” (NRG/Petra Nova)

Estimated Value of Potential Incentives on Large CO₂ Pipeline

Potential Incentive	Description	Advantages	Disadvantages	Estimated Value (US\$MM)
Ross / Navarro Infrastructure Tax Credit Proposal	82% tax credit on equity portion of capital, assuming 5:1 debt to equity	High value impact depending on debt to equity ratio	Requires legislation Depend on tax status of investor	\$172
Accelerated Depreciation	MACRS5 schedule vs. MACRS15	Consistent with tax treatment of carbon capture / renewable energy	Requires legislation. Depend on tax status of investor	\$115
Paul Ryan tax reform	<ul style="list-style-type: none"> Full depreciation in Year 1 20% CIT 	Additional benefit of 20% CIT	Requires legislation	\$290
Private Activity Bonds	Enable CO ₂ pipeline projects to utilize tax exempt bonds	Low cost to government	Interest rate discount only exists for short term bonds	\$37
Federal Loans (LPO or TIFIA)	Allow CO ₂ pipelines to qualify for existing federal loan programs	LPO programs exist, money already allocated.	TIFIA would need legislation. Requires DOE to apply "innovative" status to pipelines	\$117
Direct Grant	\$500 million direct grant	Lower capital of pipeline	Requires approval / government funds allocation	\$348

DISCLAIMER: Subject to numerous assumptions and data from various sources.

Summary

- Occidental Petroleum Corporation is the world leader in CO₂ EOR
- Occidental has taken a leadership role by developing and gaining EPA approval for two MRV Plans
- Occidental is supportive of efforts that enable the rapid deployment of Carbon Capture, Utilization and Storage (CCUS)
- Occidental supports incentives that would accelerate CCUS
 - 45Q extension bills
 - CO₂ pipeline incentives