Carbon Capture & Ethanol

The Perfect Fit

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white-energy.com
Why Carbon Capture Matters

Background on White Energy
Our company and our history with CCS

Occidental Petroleum Announcement
Details and what it means

Carbon Capture & Ethanol
Why it makes environmental and financial sense
Introducing White Energy

One of America’s leading producers of biofuels, food ingredients and animal feed

Ethanol
Capacity to produce more than 300 million gallons of ethanol per year

Gluten
The largest manufacturer of vital wheat gluten in North America

Co-Products
Valuable co-products include wet and dry distillers grains for use as livestock feed

Carbon Capture Initiatives
Our Operations

Four state-of-the-art grain processing facilities strategically located in Texas and Kansas

- **RUSSELL, KS**
  - Ethanol and Vital Wheat Gluten Production

- **HEREFORD & PLAINVIEW, TX**
  - Ethanol Production

- **PLANO, TX**
  - Corporate Office
Profile: Hereford, Texas

Ethanol production has increased nearly 20 percent in the past five years

Overview
- Designed by ICM. Built by Fagen.
- Began operations in 2008

Ethanol Production
- Nameplate: 100M gallons per year
- Permitted Capacity: 130M gallons per year
- 2017 Production: 113M gallons
- 2018 Production: 123M gallons (projected)

Operational Details
- Feedstock: Milo/Corn Feedstock Capabilities
- Storage Capacity: 3M gallons of ethanol
- Co-Products: Wet Distillers Grains, Corn Oil

Celebrating 10 Years
The Hereford plant has produced more than 1 billion gallons of ethanol since beginning operations 10 years ago.
Profile:
Plainview, Texas

Strategically located with easy access to the nation’s largest ethanol markets in both the US and Internationally

Overview
- Designed by ICM. Built by Fagan.
- Began operations in 2008

Ethanol Production
- Nameplate: 100M gallons per year
- Permitted Capacity: 120M gallons per year
- 2017 Production: 114M gallons
- 2018 Production: 118M gallons (projected)

Operational Details
- Feedstock: Milo/Corn Feedstock Capabilities
- Storage Capacity: 3M gallons of ethanol, 2M bushels of grain
- Co-Products: Wet/Dry Distillers Grains, Corn Oil

A new permit, expected to be finalized in 2018 will increase production capacity to 130 million gallons per year

Investing in the Future
White Energy has invested more than $25 million in capital improvements at the Plainview plant.
Profile:
Russell, Kansas (Ethanol)

The most cost efficient ethanol plant in the United States

Overview
- Designed by ICM. Built by Fagen.
- Began operations in 2001

Ethanol Production
- Nameplate: 30M gallons per year
- Permitted Capacity: 55M gallons per year
- 2017 Production: 49M gallons
- 2018 Production: 49M gallons (projected)

Operational Details
- Feedstock: Corn/Sorghum/Wheat Starch
- Storage Capacity: 2M gallons of ethanol, 1.6M bushels of grains
- Co-Products: Wet/Dry Distillers Grains

The adjacent gluten operation provides low-cost wheat starches that account for 1/3 of the feedstock supply — a competitive advantage that makes the Russell plant the most cost-efficient in the nation.

First in the Nation
When the Russell plant opened in 1995, it was the first ICM designed ethanol plant in the nation.
Profile:
Russell, Kansas (Gluten)

The largest gluten processing facility in North America

Overview
▪ State-of-the-art plant featuring dry milling, gluten separation, drying, product blending, and packaging lines
▪ Began operations in 1995

Gluten Production
▪ Permitted Capacity: 55M lbs per year
▪ 2017 Production: 44M lbs
▪ 2018 Production: 45M lbs (projected)

Operational Details
▪ Wheat starch created during the production process is used as feedstock at the adjacent ethanol plant
▪ FDA approved facility ensures safety and quality
▪ Co-Products: Wheat Midds

White Energy distributes safe, quality gluten under the Heartland brand name to America’s most iconic food and beverage companies.

A National Leader
The Russell plant is the largest supplier of Gluten in the United States which is growing at 5.3% per year
White Energy CO2 History

1998-99  CO2 EOR feasibility study conducted by University of Kansas (KGS and TORP), and Shell CO2 Company (now Kinder Morgan CO2 Co. L.P.). Submitted grant proposal (1999) to DOE.

2000-01  DOE grant awarded for CO2 EOR and work begun. Data gathering, reservoir characterization, drill and core CO2 injection well, additional resource assessment reservoir simulation, and technology transfer.


2002  Co-gen plant start-up in March. Final decision on how to proceed with EOR pilot, finish wellbore upgrades and testing, and install surface facilities, repressuring reservoir to 1250 psi (presently 600-800 psi), and CO2 injection began.

2003-05  CO2 slug and WAG (CO2 injection ended June 17, 2005 continuous water flooding June 21st 2005)

2005-07  Post-CO2 waterflood

RESULTS
Approximately 95% of the injected CO2 remained in the reservoir.

An estimated 27,902 bbls of oil recovery was attributed to CO2 injection (through March 2010)
What Sets Us Apart

Environmental Responsibility

We produce ethanol with some of the lowest carbon intensity ratings of any plant in the nation.

- Ethanol produced at the Russell plant has the lowest carbon intensity rating approved by the California Air Resource Board (CARB).
- Capital improvement projects — including updated waste water treatment facilities and the use of integrated zero liquids discharge technology — have reduced water consumption and decreased electric usage.
- Well-positioned to pursue Enhanced Oil Recovery (EOR) and Carbon Sequestration (CCS) projects due to close proximity to the Permian Basis.
Innovation Projects

Enhanced Oil Recovery (EOR)
Carbon Capture & Sequestration (CCS)
Industrial Grade Alcohol
White Wheat Gluten
Biodiesel
Enhanced Oil Recovery Opportunities
How White Energy and Occidental Petroleum are working together
Carbon Capture Opportunities

**CCS: A solution for meeting climate mitigation targets**

- California to adopt CCS/CCUS for cap and trade as well as LCFS in near future; Oregon and Washington may soon follow suit.
- As carbon taxing becomes more prevalent, carbon producers must mitigate CO2 emissions through sequestration or by purchasing offsets.
- Among major CO2 emissions sources, ethanol fermentation is the cleanest — and the cheapest — to capture. Low hanging fruit for CCS projects.
CO₂ Enhanced Oil Recovery
Project Overview

White Energy partnered with Occidental Petroleum to conduct a FEED study to refine the investment case for one or more transformational CO₂-EOR projects. Key drivers include:

Expansion of 45Q federal tax credits
- Improved tax incentives -- up to $35.00 per metric ton for CO₂ used in EOR
- Smaller-scale projects now eligible (threshold reduced from 500 thousand metric tons per annum (“kmtpa”) to 100-150 kmtpa)

LCFS attribution of a CI point reduction to ethanol with CO₂ capture for use in EOR targeted for September 2018 approval
CO₂ Enhanced Oil Recovery
Project Overview

*Project structure still being developed. Potential value sharing includes:*

- Oxy and White Energy provide capex (compression, pipeline, etc.) and operate the project
- White Energy supplies high-purity CO₂
  - (~98.5% purity from fermentation and scrubbing processes).
- The Project is expected to qualify for 45Q
- LCFS/low carbon intensity value attributes
CCUS with CO$_2$ Enhanced Oil Recovery: FEED Study

**Front End Engineering Design Study**
- Set design parameters for capture facility
- Set design parameters for CO$_2$ compression
- Set design parameters for pipeline
- Scope cost of facility
- Scope cost of pipeline
- Scope timeline

*Source: Company Management.*
Diversification Through Carbon Initiatives

2021 Growth / Diversified Earnings Outlook:
- EOR presents an opportunity to further diversify White Energy’s revenue streams via 45Q tax credits, CO₂ sales, D5 RINs, and CI attributes

Source: Company Management.
* 45Q EOR tax credit grossed up to a revenue equivalent based on 21% tax rate.
CO$_2$ Enhanced Oil Recovery: Downstream Market Access

White Energy is uniquely situated in close proximity to existing CO$_2$ pipeline infrastructure that supplies the growing appetite for Permian CO$_2$ - EOR applications

- Multiple pipelines / EOR projects are in close proximity to our Texas facilities.
- Permian Basin demand for CO$_2$ remains strong as technology advancements continued to identify additional EOR exploitable reserves.

Source: Company Management, DOE-NETL
Why Carbon Capture Projects Make Sense for White Energy

- **Increased value for White Energy**
- **Occidental Petroleum is a leader in the EOR space**
  By leveraging Oxy’s in-house expertise, relationships and 50+ years of operating experience, White Energy can substantially increase the chances of a successful EOR project
- **It’s the right time...**
  There is a 6 year window to qualify for the 45Q credits
  (Required start date: 2018-2023)
- **EOR is proven technology used in the Permian**
Thank You!