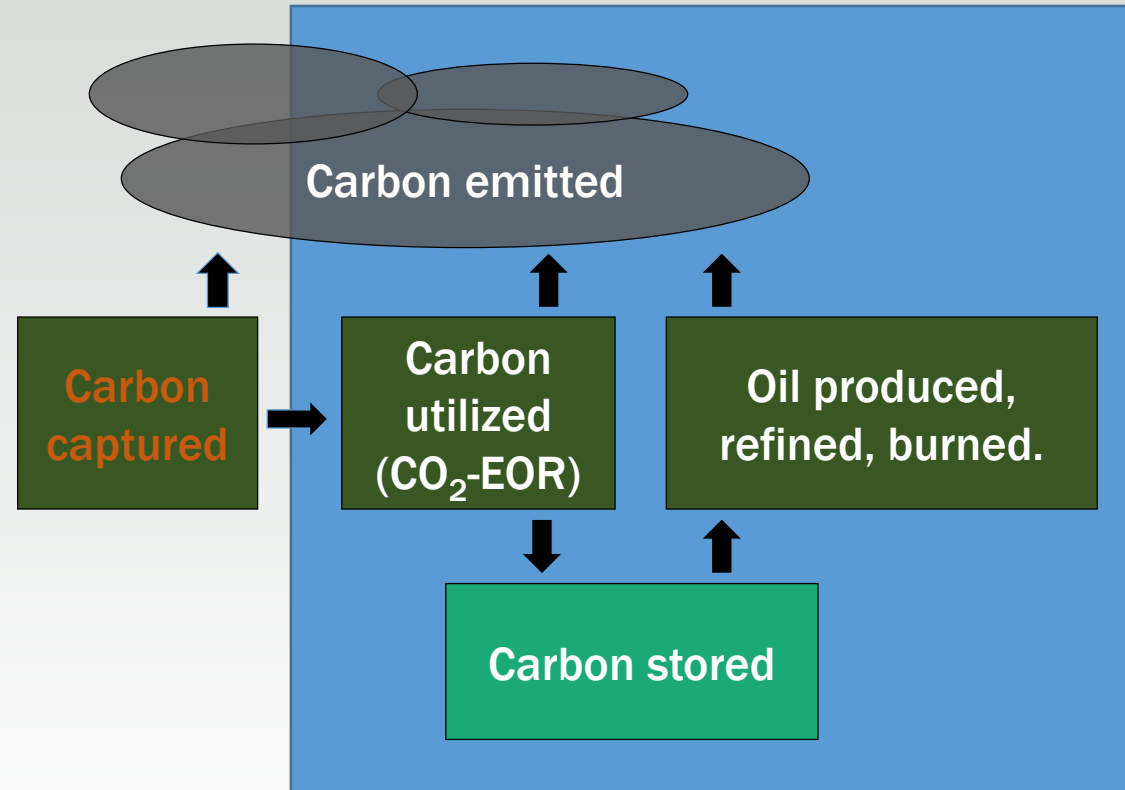


# CO<sub>2</sub>-EOR: an option for reduced carbon oil?

## Cranfield Case

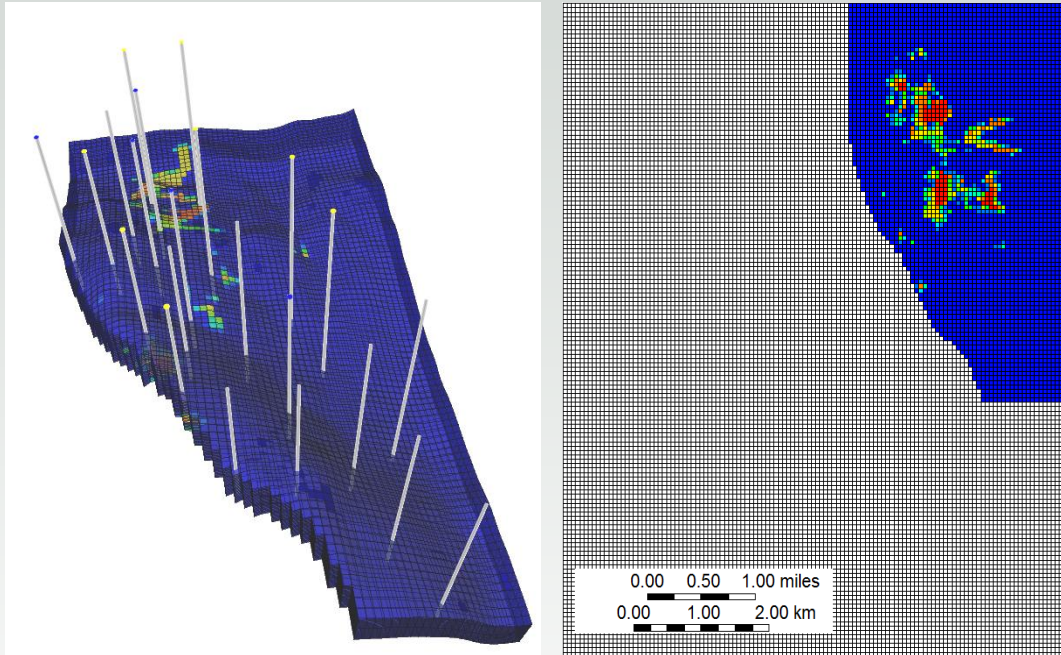
Vanessa Nuñez-López, Ramón A. Gil Egui, and Seyyed Hosseini

# Net Carbon Negative Oil (NCNO)



# Case Study: Cranfield, Mississippi

Numerical Simulation to obtain CO<sub>2</sub> storage, oil production, CO<sub>2</sub> Utilization



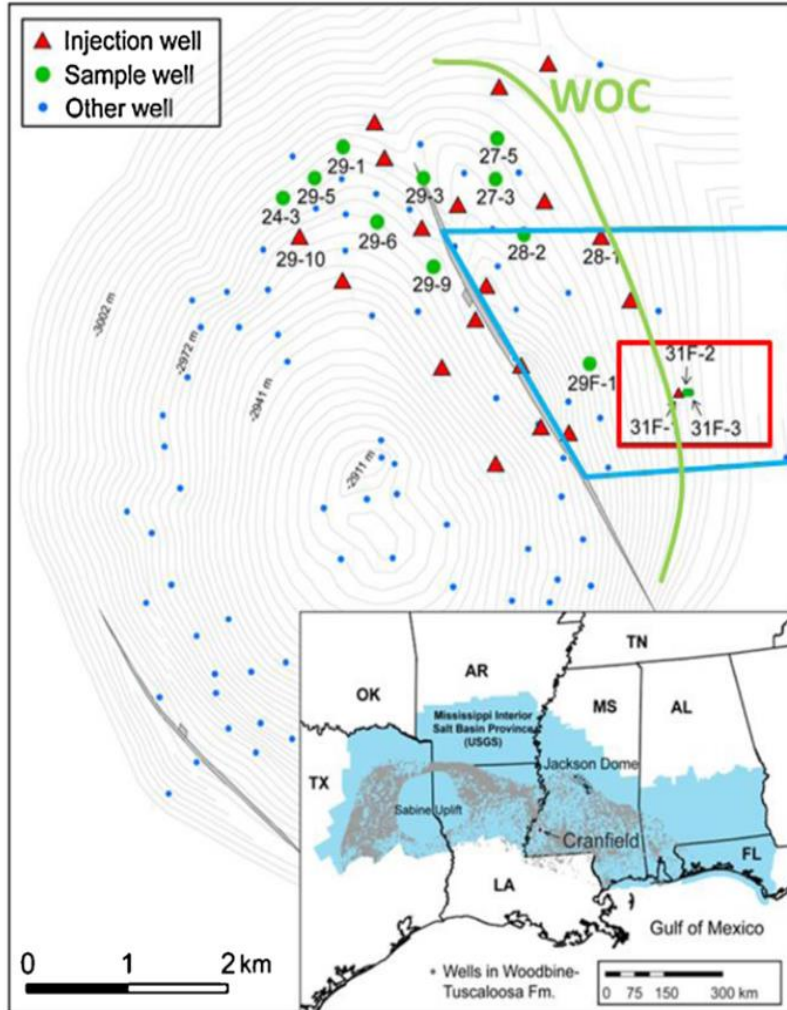
- **Compositional simulation**
- **Total number of block = 82,500**
- **25 yrs injection +75 yrs of post injection**

- **CMG-GEM compositional package**
- **Solubility modeled with Henry's law**
- **Oil and gas PVT tuned**
- **History matching of historic production data (1944-1964)**
- **Oil, water, gas production data is available**
- **Shut-in period (1964-2008)**

## **CO<sub>2</sub> Injection Scenarios:**

- **Continuous Gas Injection (CGI)**
- **Water Alternating Gas (WAG)**
- **Water Curtain Injection (WCI)**
- **Hybrid WCI + WAG**

# CO<sub>2</sub>-EOR GHG accounting:



## Gate to Gate (EOR Site) boundary:

### Indirect Emissions:

- Artificial Lift (Gas Lifting)
- Gas Injection Compression
- Pumping for injection and fluid handling
- Gas Separation Process

Power source from SRMV Grid (468 KgCO<sub>2</sub>e/MWh)

### Direct Emission:

- Bulk Separation (VOC)
- Fugitive CO<sub>2</sub> released to air

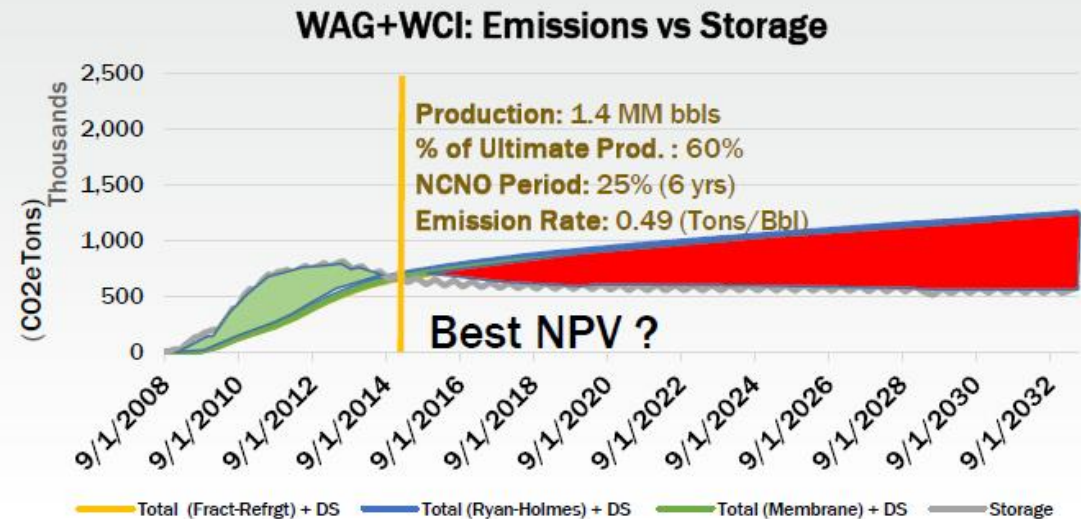
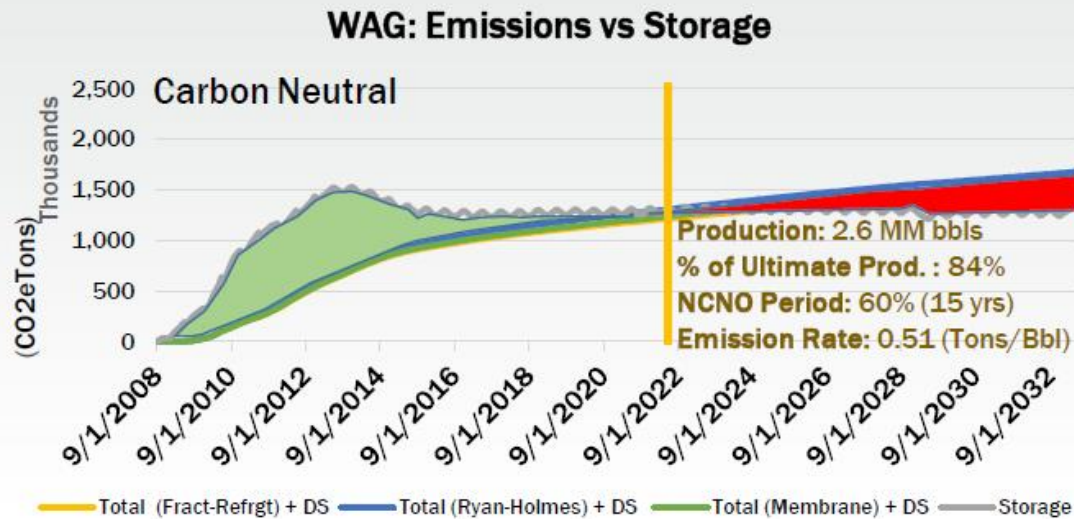
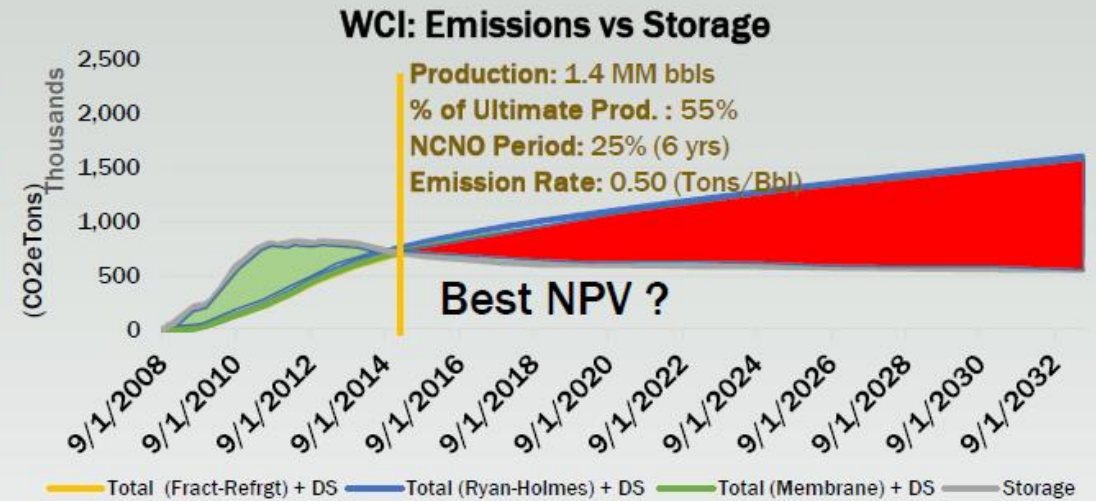
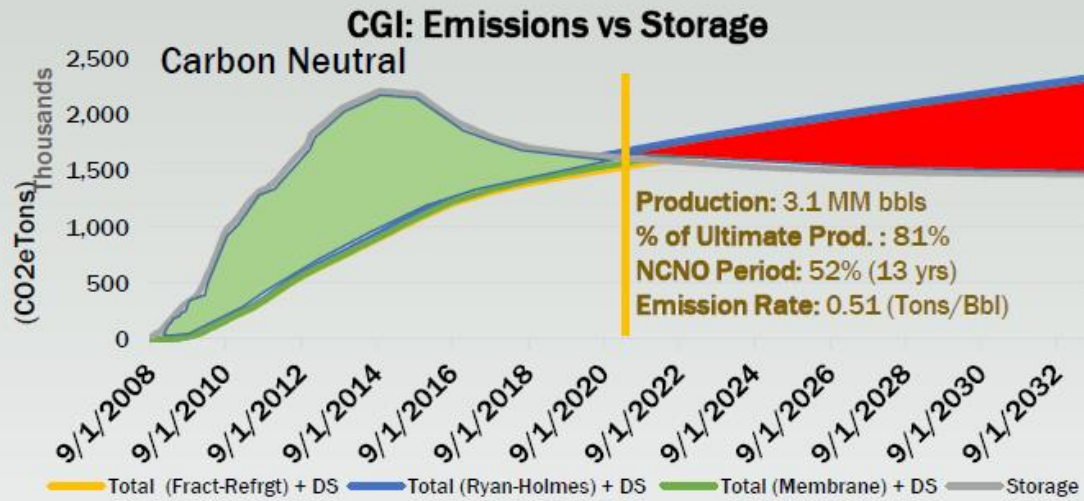
## Gate to Grave boundary:

### EOR Site + Downstream:

- + Refinery
- + Product combustion

EIA average of carbon content and heat content of crude oil going into U.S. refineries

# Carbon Balance Evolution: Gate to Grave



# Impacts and Key Findings

- ✓ **Validated CO<sub>2</sub>-EOR as a greenhouse gas emission reduction technology.**
- ✓ **Obtained results that show how in our case study (Cranfield) all CO<sub>2</sub>-EOR injection strategies start producing NCNO and at some point transition into producing net carbon positive oil (NCPO).**
- ✓ **The NCNO period (with beneficial implications for carbon credits or tax deduction) can be engineered to last longer, as it is highly dependent on the CO<sub>2</sub> injection strategy.**