Berexco KS and NE CO2 EOR Perspective
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• Berexco is both an oil producer and an ethanol producer.

• Berexco LLC – a private oil and gas company based in Wichita KS. Beren family company.

• Trenton Agri Products – private ethanol producer with 45 MMGPY plant near Trenton NE.
Topics

1. Berexco’s Wellington, Kansas CO2 EOR and Storage Projects
   • Well permitting and demise of CO2 storage portion of project
   • Successful CO2 EOR project

2. Berexco’s pending Nebraska CO2 EOR Project

1. 45Q and where we go from here in Kansas and Nebraska
Wellington CO2 Overview
DOE-Funded, KGS/Berexco Project

1. Successful 20-acre EOR pilot test
   – CO2 injection in Mississippi formation (3600 ft).
   – Demonstrate oil recovery and CO2 retention
   – Completed. 83.3% of CO2 retained in reservoir. Good incremental oil recovery.

2. Deep CO2 storage in Arbuckle saline aquifer formation at 5100’ depth.
   – Goal: demonstrate CO2 can be safely, permanently stored in the Arbuckle (5100 ft).
   – Never obtained Class 6 injection permit from USEPA despite 6 years of effort. Dropped.
CO2 Injection Permits

Class 2 permit
• Oilfield injection for EOR.
• KCC has primacy. Similar in NE, OK and TX.
• USEPA has oversight role but states issue permits.
• Well regulated process taking about a month.

Class 6 permit
• CO2 injection for permanent storage.
• Modeled off Class 1 Hazardous Waste Permits.
• USEPA has Primacy in all states except North Dakota.
• Extremely arduous process. Only two permitted in US. KGS and Berexco worked on Class 6 permit over 6 years.
  – Work begun October 2012, Submitted 1468 page permit application May 2014, Suspended March 2018
Class 2 Permit

• Protects Useable Drinking Water – surface casing covering USDW cemented to surface.

• Requires production casing be cemented well above injection perfs, but not necessarily to surface.

• Area of review completed by State regulators to confirm no improperly plugged wells or conduits

• MIT testing and Monitoring of annulus required. Well can be inspected by state regulators at any time

• You can actually get a Class 2 permit
Wellington Mississippian Structure

20 MMBO Cumulative Oil

Additional science wells

CO2 Injection well

Area of response

CI = 5 ft

1 mile (1.6 km)
Wellington CO2 Project

1 mile (1.6 km)
Wellington KGS 2-32 Neut-Den Log

Mississippi

Dolomite and Chert

Cherty Dolomite
Surface injection, production and monitoring equipment

**CO2 Storage Tanks**

- CO2 Flowmeter at injector wellhead.
- Temp. sensor at injector wellhead
- Water Flowmeter at injection wellhead
- CO2 Flowmeters at producing wells
- CO2 Flowmeter at tank battery
Wellington Automation System
Wellington CO2 Accounting

- 374,461 MCF Injected (21,784 US tons). 1,101 Truckloads, each about 20 US tons. Delivered cost $90.16/US ton
- 62,355 MCF of CO2 injected was produced (vented) as of 7/1/2018 (16.7%)
- 83.3% of CO2 still in reservoir. “First pass sequestration efficiency”
- Estimated oil recovery 32,000 bbl. 11.7 MCF/bbl
Incremental Oil Production Approx 16,000 bbl Oil as of 6/1/2018
Average injection rate 2,500 mcfd
Maximum production rate 700 mcfd
Where do we go from here in Wellington?

• Class 6 Permit Unrealistic. Time and costs imposed by EPA not workable.

• Consider full field CO2 EOR, but need CO2 Source via rail or pipeline. 6-10 MMBO potential oil recovery.

• Will 4Q5 provide the incentive?

• CO2 EOR is the vehicle for CO2 Sequestration, not Class 6.
Berexco Nebraska CO2 Project

• Multiple Waterfloods Operated by Berexco with CO2 EOR potential.

• Potential to use CO2 from Trenton Ethanol Plant (TAP) via pipeline to field. 7 MMCFD.

• Integrated rail delivery of CO2 to TAP siding and offload CO2 to pipeline to field.

• 4Q5 Incentives?
Trenton NE Ethanol Location
Hitchcock CO NE: LKC Zone Waterfloods
Area Cumulative Oil 33.6 MMBO, Current 1,000 bopd

5 mile (8 km)
Boevau Canyon Unit
6 MMBO Primary + Secondary, MMP 1500 PSI
Q45 Perspectives

• Crucial issue will be program rules required to obtain the tax credits.
• If rules are too onerous, the credit is not real and the program will fail.
• CARB experiences in California – super tough rules make it unworkable.
• Need bell cows to show industry the way.
Why aren’t we doing CO2 Floods in KS/NE???

• Need sustained high oil price.
• Costs are too high relative to recovery.
• No convenient, cost effective CO2.
• Oilfields are smaller than TX, dispersed
• Government incentives have not proven to be real – yet...
One final thought...

• CO2 EOR and CO2 Sequestration can succeed in Kansas and Nebraska, but it takes:
  
a) Realistic Q45 program rules and credits that actually materialize and create CO2 availability.
  
b) A real opportunity for ethanol producers and oil companies to make money.