Development of Glenrock Area Fields, Converse County, Wyoming*

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Abstract

In 1916, shallow Shannon Formation oil was discovered on an “oil claim” on University of Wyoming Land Grant acreage near Parkerton about 20 miles east of Casper. This discovery would become the huge Big Muddy Field, rivaling the Salt Creek Field in size and activity. Development soon included the Frontier 2nd Wall Creek, and Dakota Formations. Since then, the Glenrock fields have produced more than 140 MMBO. Revenues from Big Muddy State leases allowed University of Wyoming to survive the depression and construct several buildings at a time when their very existence was in doubt. Poor early-day production practices led to substantial waste. Conoco built the Glenrock refinery in 1925 to process crude from Big Muddy Field and other areas.

A deep test to the Madison Formation in 1935 found no significant shows below the Dakota. By 1943, the Big Muddy Field was essentially depleted after having produced about 30 MMBO. Dakota and Muddy Formation production was discovered in the South Glenrock fields around 1950, and water flooding began in the 1960s. Encouraged by a 1973 low-tension pilot test at Big Muddy, Conoco and DOE teamed up for an unsuccessful Frontier surfactant flood in the 1980s.

In 2007, Rancher Energy purchased the Big Muddy, South Glenrock, and South Cole Creek fields for CO2 tertiary recovery. Nitec LLC estimated that CO2 flooding could potentially recover in excess of 10,000 b/d each from South Glenrock and Big Muddy fields. Rancher acquired a take-or-pay CO2 contract and conducted pipeline and facility FEED studies. In 2009 Rancher attempted to join forces with Elk Petroleum, whom they saw as being likely to get a better CO2 contract.

In 2011, Queensland-based Linc Energy purchased the fields from a reorganized Rancher, which was recovering from a hostile takeover. Best known for its underground coal gasification (UCG) technology, Linc hoped to conduct miscible floods using waste CO2 from their UCG projects in the Powder River Basin. Linc acquired an interruptible CO2 contract from Exxon, built a line tap, and planned to truck CO2 from Jeffrey City to Glenrock. Linc planned CO2 injection rates of up to 30 MMCFD after completion of the CO2 injection infrastructure. In 2011, Linc unsuccessfully attempted a Dakota CO2 cycling (huff-n-puff) project in South Glenrock B using 500 tons of CO2.
Linc subsequently sold all of the Glenrock properties to Glenrock Energy. In 2016 Glenrock Energy began focusing on re-development and optimizing depleted reservoirs. A large high-resolution 3-D seismic acquisition program has been completed. To date, there is no public information available on the company’s re-development plans or results of the 3-D seismic program.

In 2019, Southwestern Production LLC is securing State and Federal approval for the Barron Flats (Shannon) Unit north of Glenrock. The secondary unit will use a miscible natural gas flood in existing vertical Shannon wells originally drilled within the Barron Flats (Deep) Unit.
Development of Glenrock Area Fields, Converse Co., WY

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Mark Milliken
The Pennsylvania Crary Family homestead
Early 1920s Parkerton

Courtesy of Jon Nicolaysen
BIG MUDDY AREA EARLY DEVELOPMENT

1916: Shannon oil discovered, 600 FT, 26 BOPD,
1917: Frontier oil discovered, 3100 FT, 128 BOPD,
1919: Peak Shannon-Frontier production at 3.6 MMBOPY,
1922: Dakota-Lakota oil discovered,
1923: Conoco builds the Glenrock Refinery,
1935: Deep test to Madison (6597 TD) found no shows below Dakota,
1943: Comingled Shannon and Frontier were pressure depleted,
        development focused on Dakota,
1949: Cum production from all zones was 29.3 MMBO,
1953: Active water flood program began.
GENERALIZED FRONTIER STRUCTURE
PRODUCING ZONES

- Shannon
- Niobrara
- Frontier
- Upper Muddy
- Lower muddy
- Dakota
NIOBRARA
FRONTIER
UPPER MUDDY

BARBER 1
T33N R75W S17

Paleo-low structure

Glenrock
**EOR IN THE GLENROCK FIELDS**

Big Muddy 12.5% RF Underestimated?

- Poor reporting,
- Comingled production,
- Poor early development (lease basis),
- Poorly engineered water flood,
- No data prior to 1921,
- Catastrophic fire destroyed most records.
EOR IN THE GLENROCK FIELDS

(Not actual data)
Nine inverted 5-SPOTS,
Drilled 9 injectors, 12 producers, 12,000# FRACS
Four existing wells.
• Peak oil rate did not match predictive models,
• Chemical went far out of the pattern and into other formations,
• Conoco investment: $30 MM,
• DOE investment: $9.5 MM.
RANCHER CO$_2$

• **2006**: Rancher Energy Corp. acquires the Big Muddy field. South Glenrock and Cole Creek fields are later acquired,

• **2007**: Rancher enters into an onerous “take-or-pay” contract with Anadarko, allowing 25-40 MMCFD CO$_2$ delivered at Salt Creek,

• **2008**: Rancher signs a CO$_2$ agreement with Exxon allowing 70 MMCFD for 10 years with a second ten year option,

• An investor group headed by Jon Nicolaysen conducts a hostile takeover of Rancher,

• Nicolaysen leads the company through bankruptcy and settles all debts.
- 2011: Glenrock fields are purchased from Rancher for about $20 MM, or about 1/3 of what Rancher paid.

- Linc estimated 80 MMBO recoverable from CO$_2$ flooding.
UPPER MUDDY DEVELOPMENT

- Thin sandstone of uniform quality would yield fast response.

- Comingled and probably underdeveloped
LINC’S PROPOSED CO₂ SUPPLY LINE

NATURAL BRIDGE CBM PROCESSING PLANT TO GLENROCK

+/- 8 MMCFPD

15 MILES, +/- $8MM
TRUCKING CO2 TO GLENROCK

Exxon tap
Conoco #15
250 tons CO2
1991

Linc #34

Conoco #1
An incremental 12 MBO were reportedly produced

Conoco #1

CO2 cycling

Conoco #15

15 well is RED
Linc #34
500 tons CO2

Linc Attempts a CO2 Cycling Project in the Dakota Fm., November 2011
• 500 tons liquid CO2
• Soak period 21 days,
• 10 BOPD, immediately goes to 3-4 BOPD,
Well locations

Whiteside 90

Whiteside 95

THE WHITESIDE PROJECT
3 BOPD, 200 BWPD

Whiteside 90
THE WAY FORWARD?
THANKS FOR YOUR HELP

Jim Nations
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Mick Lehner
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Walt Merschat
John Scherlin
Elk Petroleum
Brian Deurloo
Frank Ingham
Steve Delger
Dale Valentine
John Bettridge
QUESTIONS?