# The Economics of Refracturing

Robert Barba and Mark Fleming

September 27, 2023


"Reducing Refrac Risk"

www.refracs.com

# Refrac Value Increase-Field Level

- Incremental cash flow from the refrac
- Protection from 60% EUR losses from offset infill well asymmetric fracs
- Behind pipe proven refrac candidate zone P1 reserve certification

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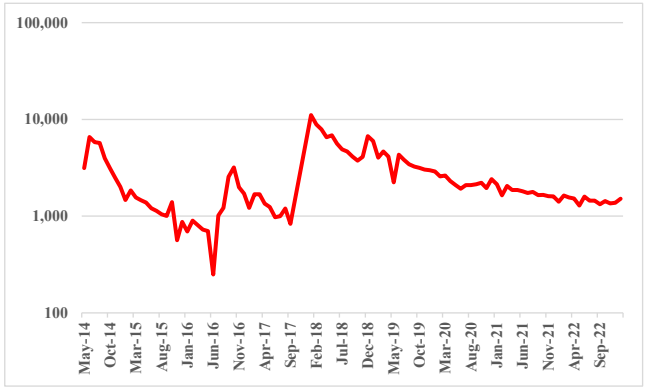
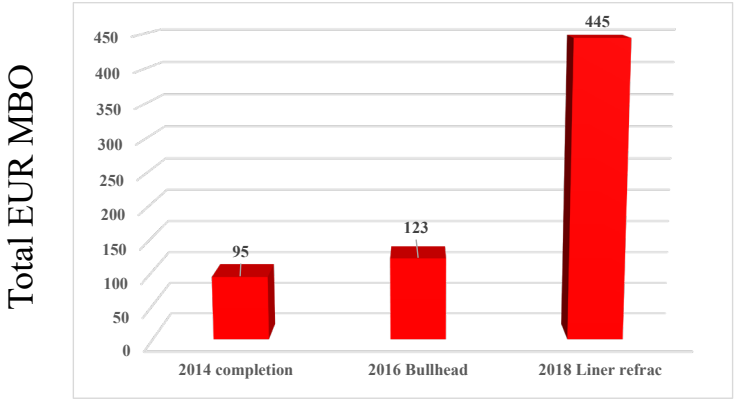
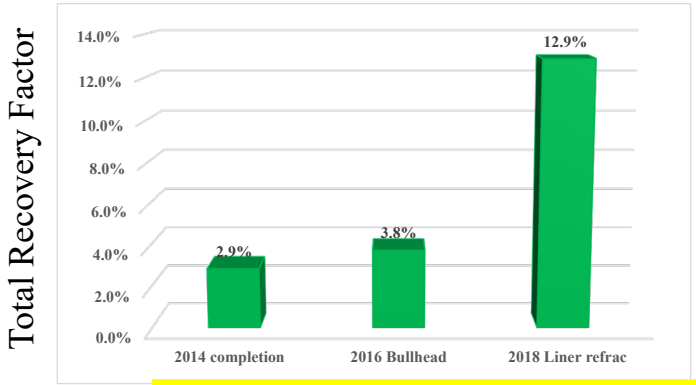
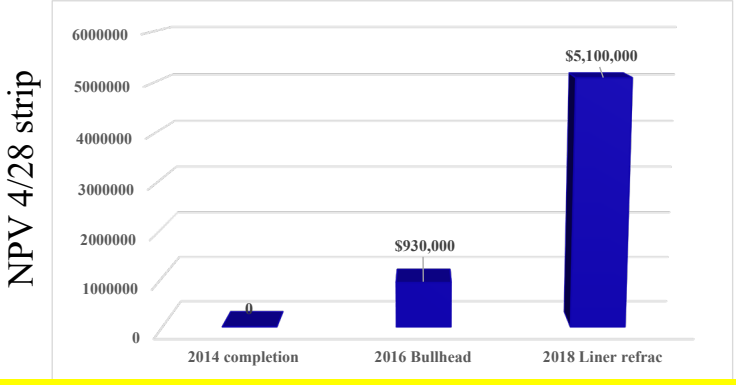
# Eagle Ford Refrac Economics Example



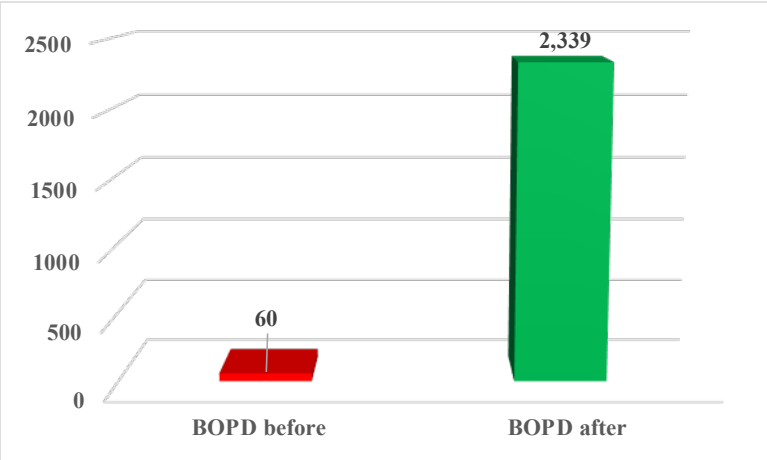



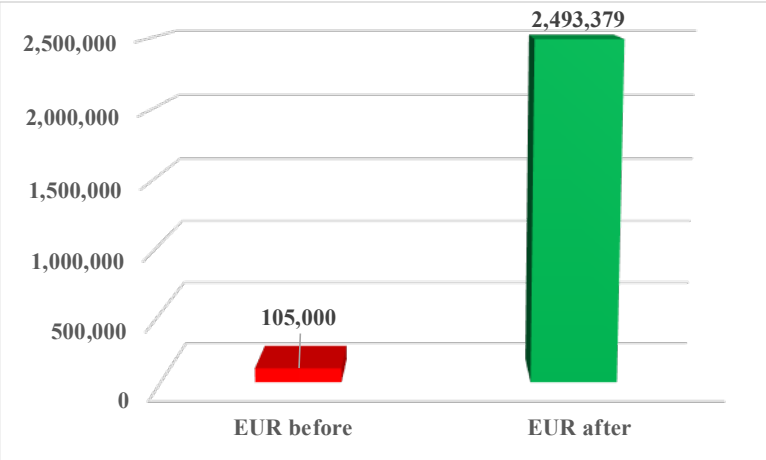

367 MBO post refrac EUR vs 321 MBO actual P50 for EFS, P10 464 MBO
Target candidates (excluding parent protection refracs) all above P50 case

Barba RE "Oil and Gas Investor" Aug 2022

# Eagle Ford Entire Pad Refrac Economics

| Well | Refrac Oil | Refrac Gas | AFE | Total PV0 | NPV | IRR |
|---|---|---|---|---|---|---|
| A | 319,334 | 494,274 | $ 3,999,500 | $ 16,722,715 | $ 6,149,704 | 77% |
| B | 303,767 | 279,167 | $ 3,613,250 | $ 15,336,233 | $ 5,740,648 | 81% |
| C | 288,493 | 143,703 | $ 3,313,250 | $ 14,174,076 | $ 5,370,459 | 84% |
| D | 281,843 | 704,378 | $ 3,305,750 | $ 15,292,994 | $ 5,989,056 | 92% |
| E | 277,355 | 162,273 | $ 4,124,000 | $ 13,634,343 | $ 4,241,988 | 52% |
| F | 262,178 | 279,531 | $ 3,614,000 | $ 13,140,016 | $ 4,453,037 | 63% |
| G | 235,526 | 187,897 | $ 3,163,250 | $ 11,491,686 | $ 3,945,254 | 64% |
| H | 187,613 | 150,494 | $ 2,735,750 | $ 8,862,337 | $ 2,835,105 | 54% |
| I | 183,978 | 91,662 | $ 3,493,250 | $ 8,516,023 | $ 1,879,359 | 30% |
| | | | | | | |
| | 2,340,087 | 2,493,379 | $ 31,362,000 | $117,170,422 | $40,604,611 | 64% |
| | | | | 3.74 | to 1 | |
| | | | | ROI | | |

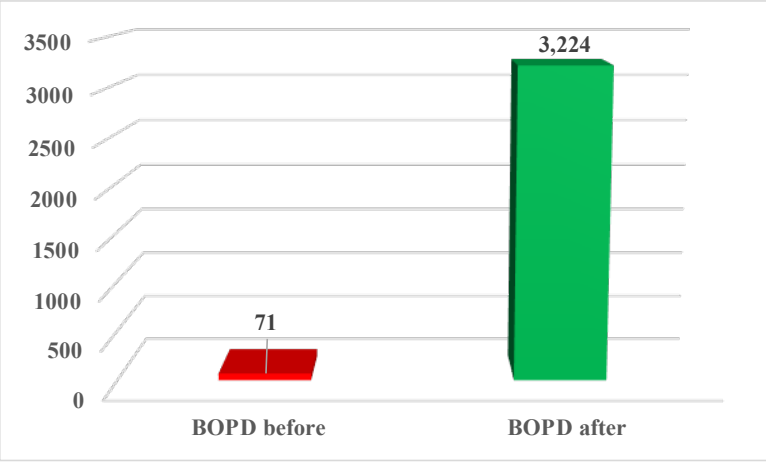


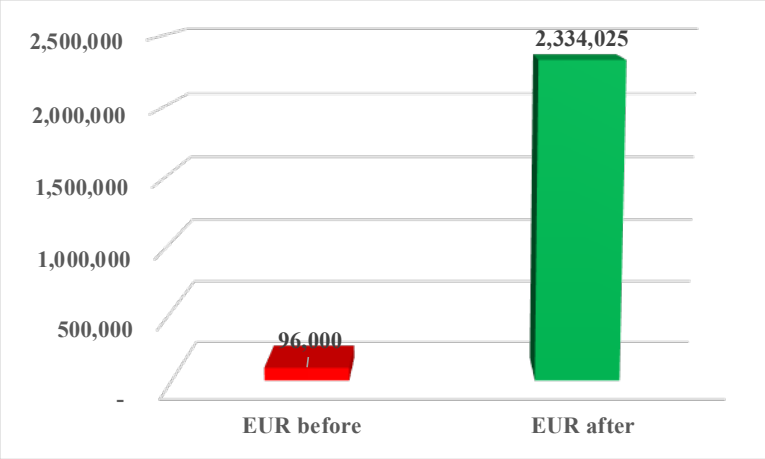



# Midland Basin Entire Pad Refrac EURS

## Wolfcamp A

| Completed | CS | Max RF | Cum Gas | Cum Oil | EUR Oil | EUR Gas | Min OIP | Avg Spcg | RF Total | Total EUR | Refrac EUR | EUR Gas | 11/23 BOPD | 11/22 MCFD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/22/2015 | 40 | 6.80% | 345,912 | 255,351 | 285,666 | 463,358 | 4,200,966 | 755 | 13.7% | 575,532 | 320,181 | 433,735 | 0.6 | 2.3 |
| 8/31/2015 | 40 | 6.80% | 692,375 | 268,186 | 493,798 | 1,657,057 | 7,261,728 | 635 | 12.7% | 922,240 | 654,054 | 1,688,568 | 18.2 | 158.8 |
| 2/17/2016 | 40 | 6.80% | 1,219,243 | 361,735 | 606,832 | 3,238,378 | 8,923,996 | 1,002 | 13.7% | 1,222,587 | 860,852 | 2,901,539 | 50.2 | 407.0 |
| 4/20/2016 | 40 | 6.80% | 343,110 | 146,536 | 310,789 | 643,972 | 4,570,425 | 605 | 12.1% | 553,021 | 406,485 | 951,774 | 8.1 | 86.9 |
| 4/20/2016 | 40 | 6.80% | 411,580 | 291,304 | 390,933 | 504,945 | 5,749,007 | 671 | 13.4% | 770,367 | 479,063 | 676,862 | 7.8 | 11.1 |
| 4/20/2016 | 40 | 6.80% | 364,610 | 140,671 | 198,754 | 466,785 | 2,922,855 | 705 | 13.7% | 400,431 | 259,760 | 673,281 | 4.6 | 15.7 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | Total | 2,980,396 | 7,325,760 | | |
| | | | | | | | | | | Avg per well | 596,079 | 1,465,152 | | |



# Refrac Value Increase-Field Level

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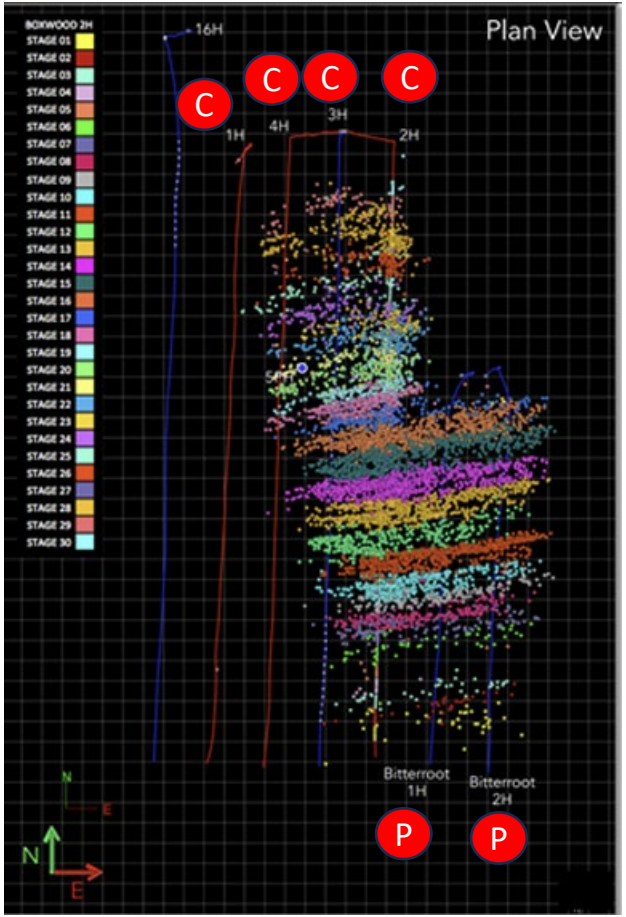
# Infill/Child Well Protection from Asymmetric Fracs

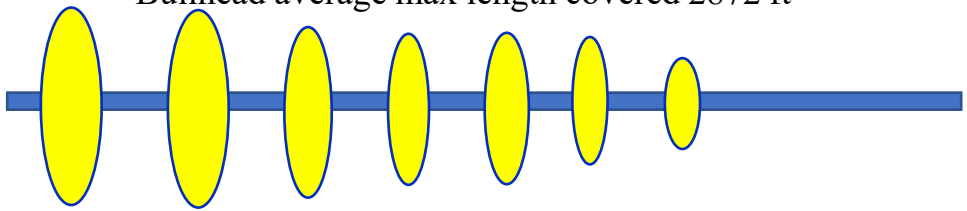



URTEC 5241 HFTS 2
Delaware Wolfcamp

# Liner vs Bullhead Refracs for Infill Child Protection

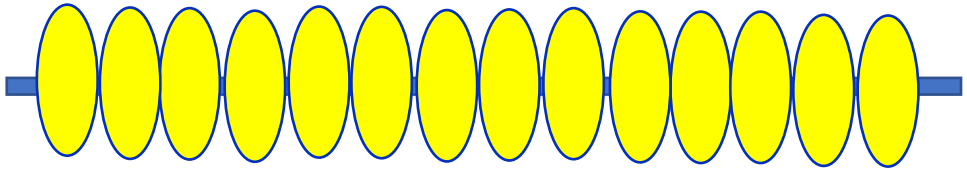
Bullhead 29% average cluster coverage vs liner refracs*
Bullhead average max length covered 2872 ft

Heel



Toe

Mech Iso liners close to 100% coverage with close cluster spacing XLE treatment

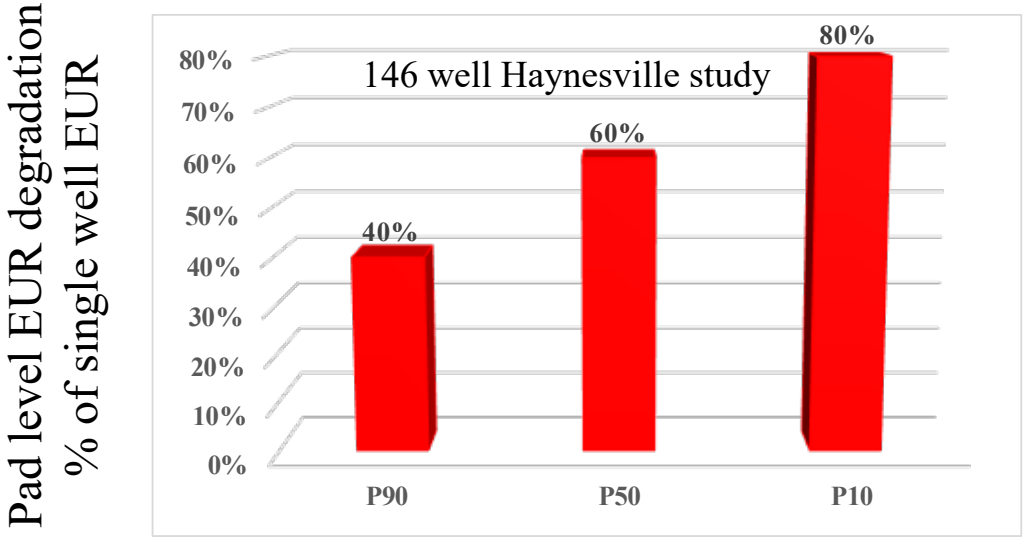


Small “Preload” treatments?

Minimal far field impact expected with small volume preloads only helps primary wells
Should have less asymmetric frac protection than larger volume diverted bullheads

*SPE-174979 Leonard et al

# EUR Loss Without Protective Refracs

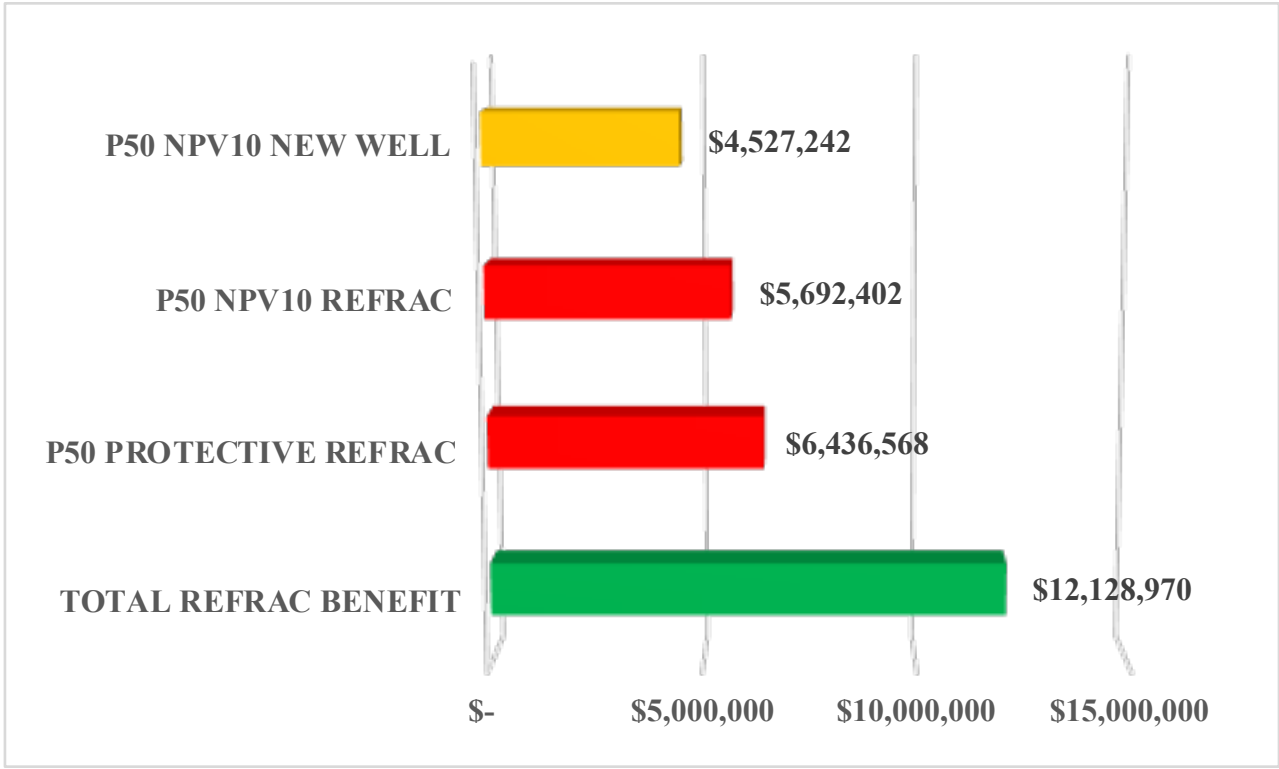



40% estimate made in initial Devon study (Elliott 2019)

Assumes only the 1st order is damaged for simplified pad level damage estimation

SPE 213075 indicates damage beyond first order offset

# EFS Refrac vs New Well NPVs




Present asset value

# Refrac Value Increase-Field Level

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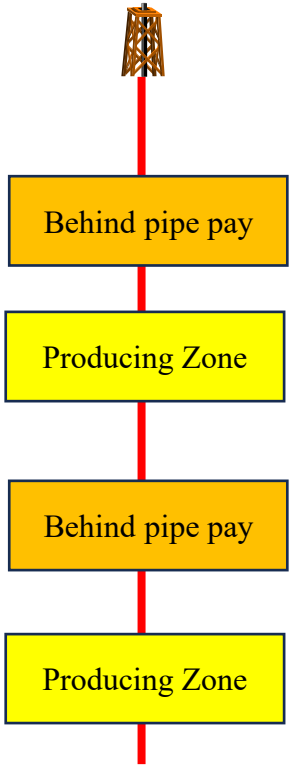
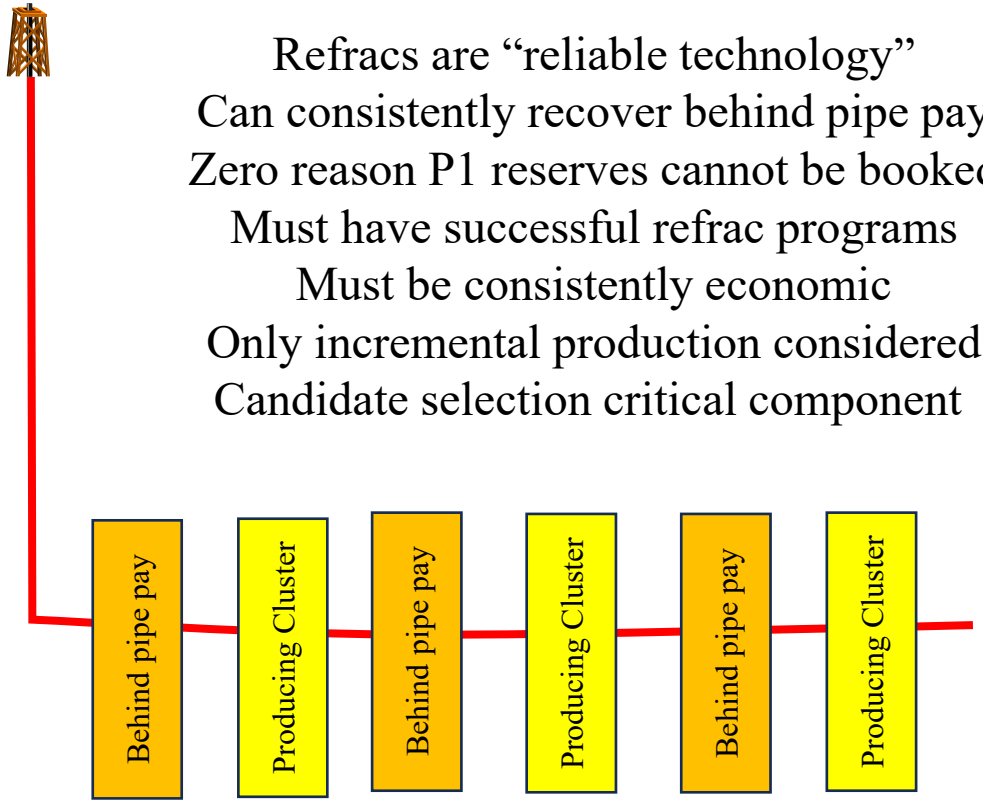
# Refracs vs Recompletions




Can book P1 reserves
for behind pipe pay
PRMS addresses this

Refracs are “reliable technology”
Can consistently recover behind pipe pay
Zero reason P1 reserves cannot be booked
Must have successful refrac programs
Must be consistently economic
Only incremental production considered
Candidate selection critical component

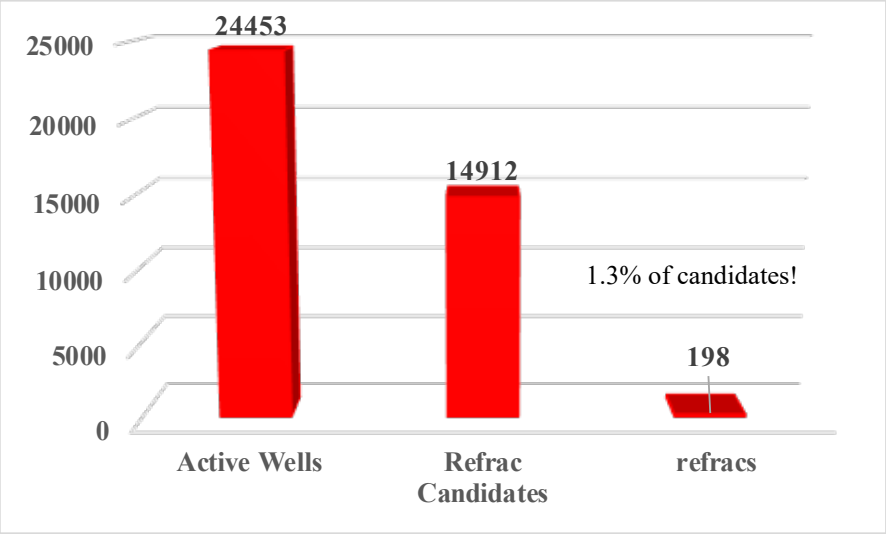


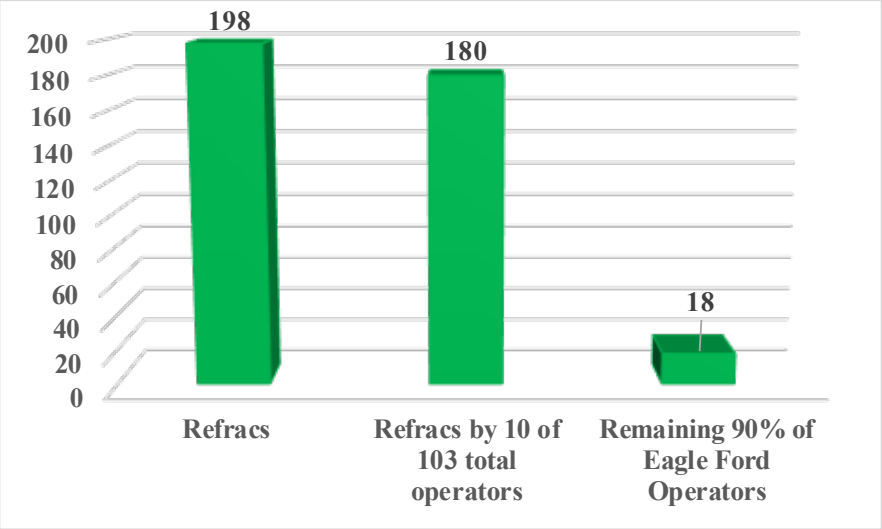

What is the difference between these two scenarios?

# Behind Pipe Reserve Booking

- Majority of wide cluster spacing wells pre-H2 2016
- Over 36,000 wells completed prior to that date in just 5 of the organic shale basins, 15,000 in the Eagle Ford
- Eagle Ford alone PV20 average of $3,693,260 per well (based on P50 post refrac declines)
- 1% of 15,000 candidates PV20 value $553,988,987
- Over half a billion dollar benefit per 1% to the industry
- “Money for nothing” isn’t just a song!
- Need consistent economic results for “reliable technology”

# Eagle Ford Refrac Statistics




14,912 wells completed prior to H2 2016 majority with >40 ft clusters

Refracs sustainable greener process to grow production without rigs

Q: What can be done to encourage more refrac activity?

Enverus database 5/14/23

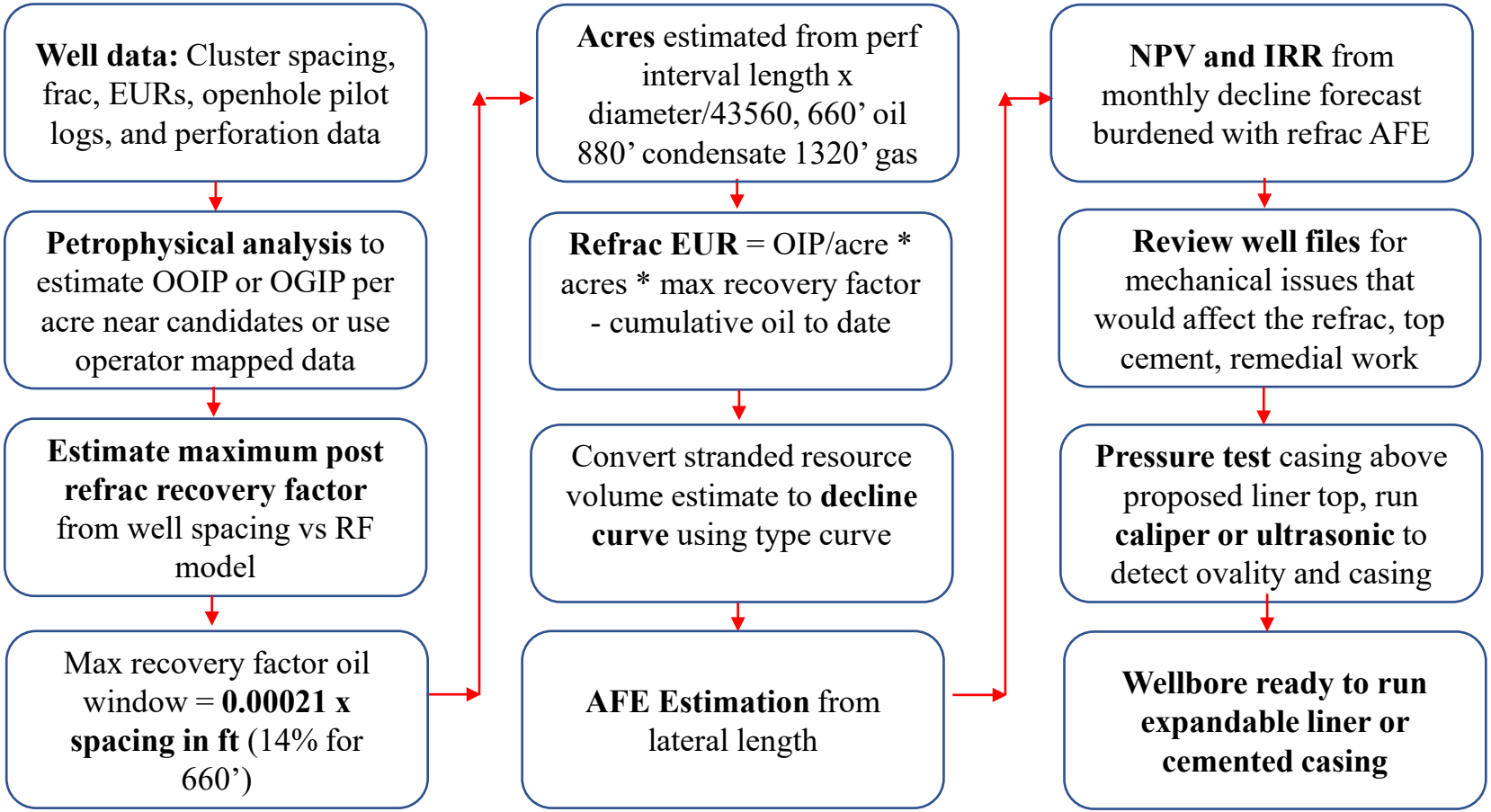
# Reducing Refrac Risk

- Discussions with operators suggest that the underinvestment in the refrac market is driven by a perception that new wells have better returns with lower financial and operational risk
- The returns are competitive in the stand alone case and superior to new wells when parent-child issues exist as we discussed
- The risk factors can be minimized with three “best practices”
  - Proper candidate selection based on OIP/GIP and well spacing
    - Petrophysical analysis integrated with structure maps
  - Proper wellbore preparation prior to running mechanical isolation
    - COP and DVN 95% success rate, Dark Vision/EV and pressure testing
  - Proper execution of the refrac treatment
    - Identical to hundreds of plug and perf operations underway as we speak

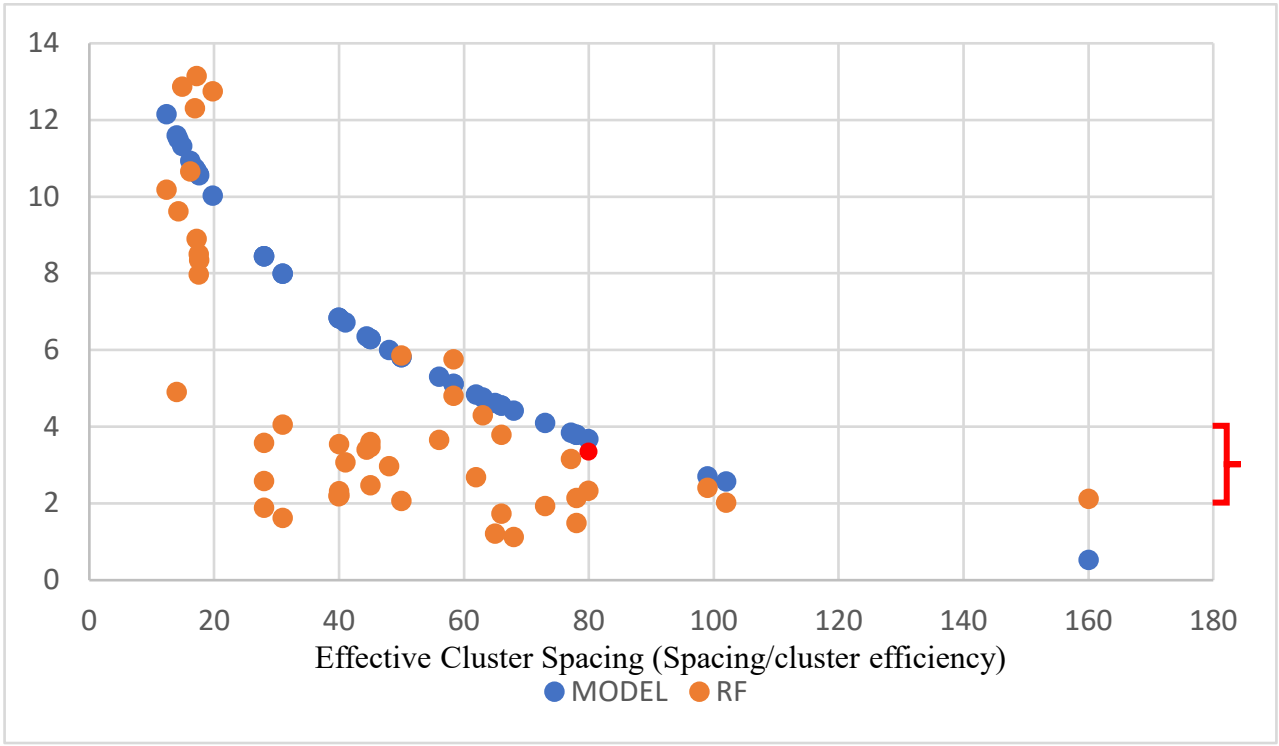
# Refrac Candidate Selection Process

- OIP or GIP per acre from openhole logs
- Maximum total recovery factor from well spacing
- Total OIP for the expected drainage area
- Post refrac EUR = Total OIP * maximum recovery – cum production prior to refrac
- Post refrac EUR to decline using type curves
- AFE from lateral length
- NPV, IRR, and ROI for the refrac

# Refrac Candidate Selection Flow Chart



# Well Data (Oil Windows)

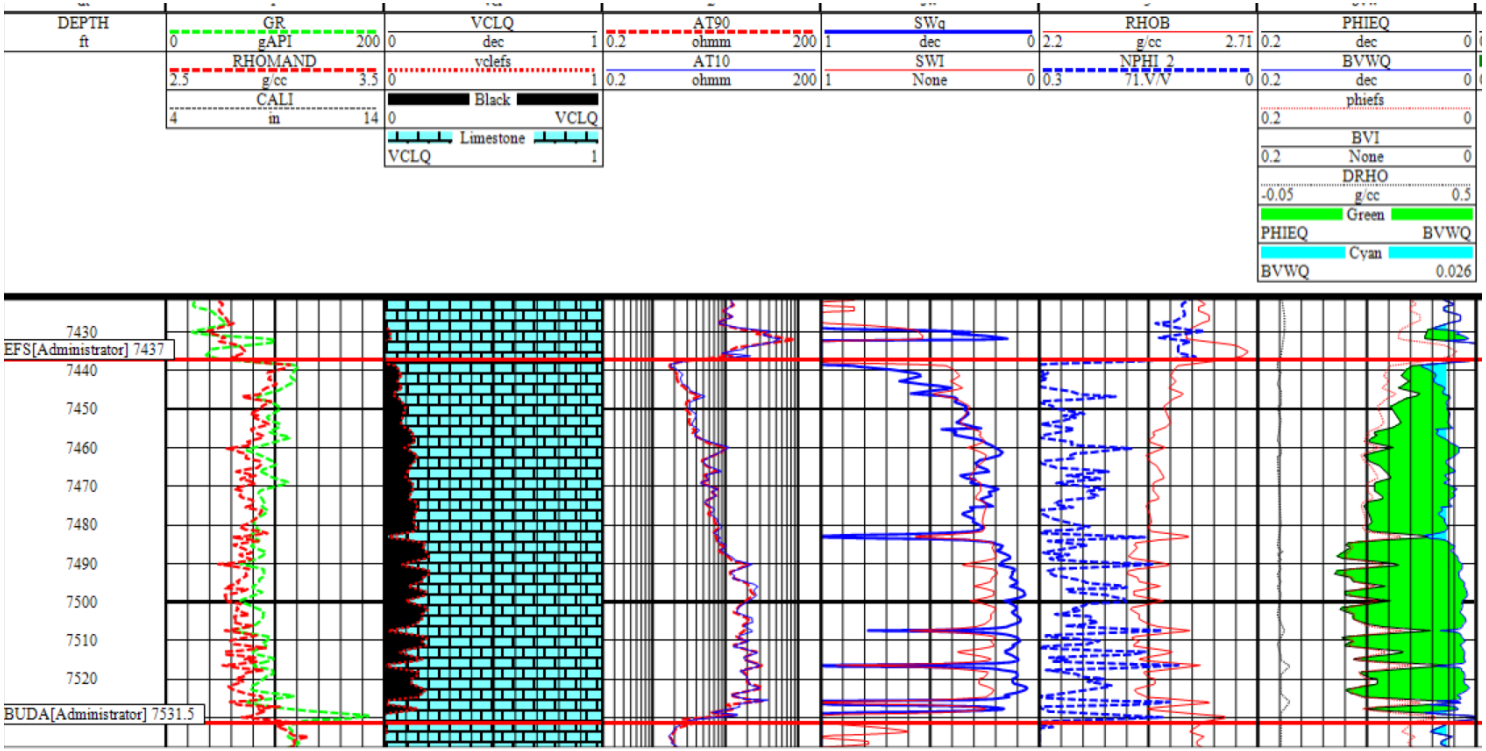



Most <H2 2016 wells
2% to 4%
range

Recovery factors should typically be less than the blue curve, 100% cluster efficiency assumed for curve
Abnormally high recovery factors suggest either a bust in the OIP/GIP or production allocation issues

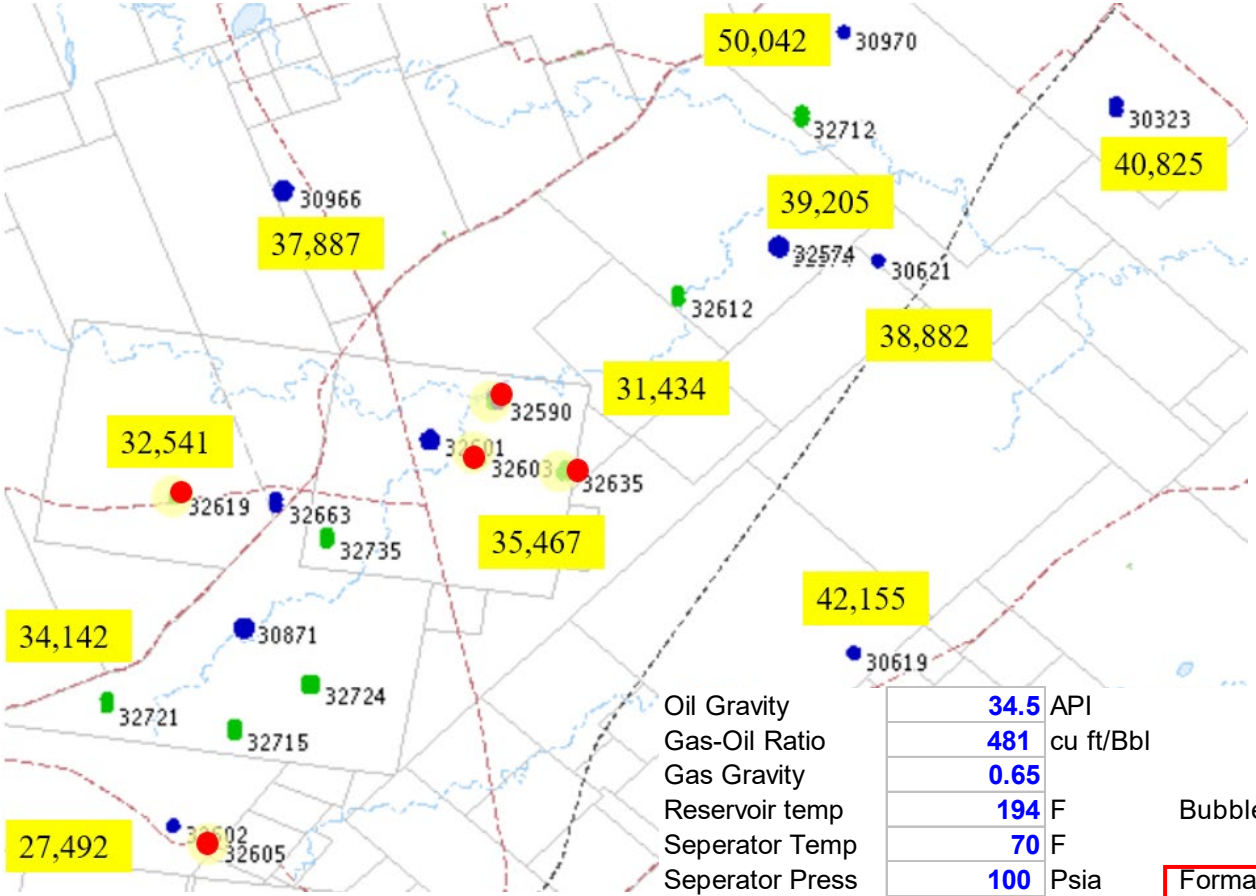
Orange dots URTEC 2662 Barba and Villarreal 2020
Blue curve Xiong et al SPE 199721

# Eagle Ford OIP per Acre Analysis




| Top | Base | Pay | Porosity | Swi | BVW | OIP/Ac |
|---|---|---|---|---|---|---|
| 7438.25 | 7528.75 | 89.3 | 0.091 | 0.275 | 0.025 | 35,467 |

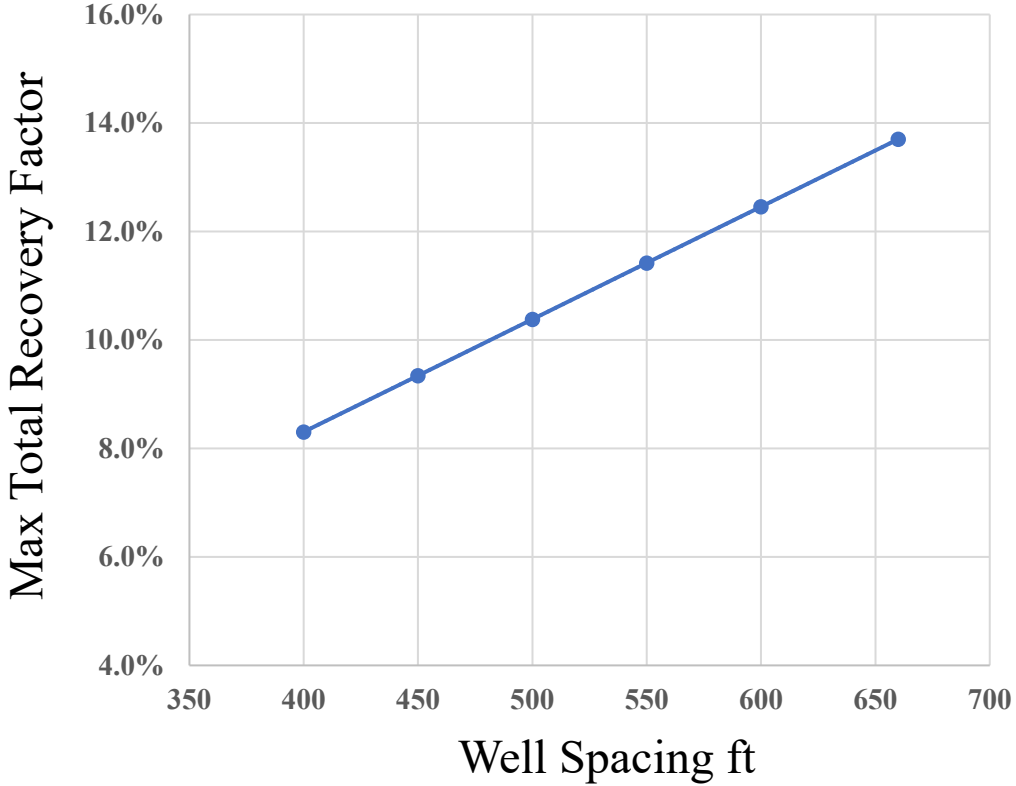
# OIP per Acre Distribution




| | | |
|---|---|---|
| Oil Gravity | 34.5 | API |
| Gas-Oil Ratio | 481 | cu ft/Bbl |
| Gas Gravity | 0.65 | |
| Reservoir temp | 194 | F |
| Seperator Temp | 70 | F |
| Seperator Press | 100 | Psia |
| Reservoir Press | 4,473 | Psia |

| | |
|---|---|
| Bubble Point Pressure | 2,711 |
| Formation Volume Factor | 1.2878 |

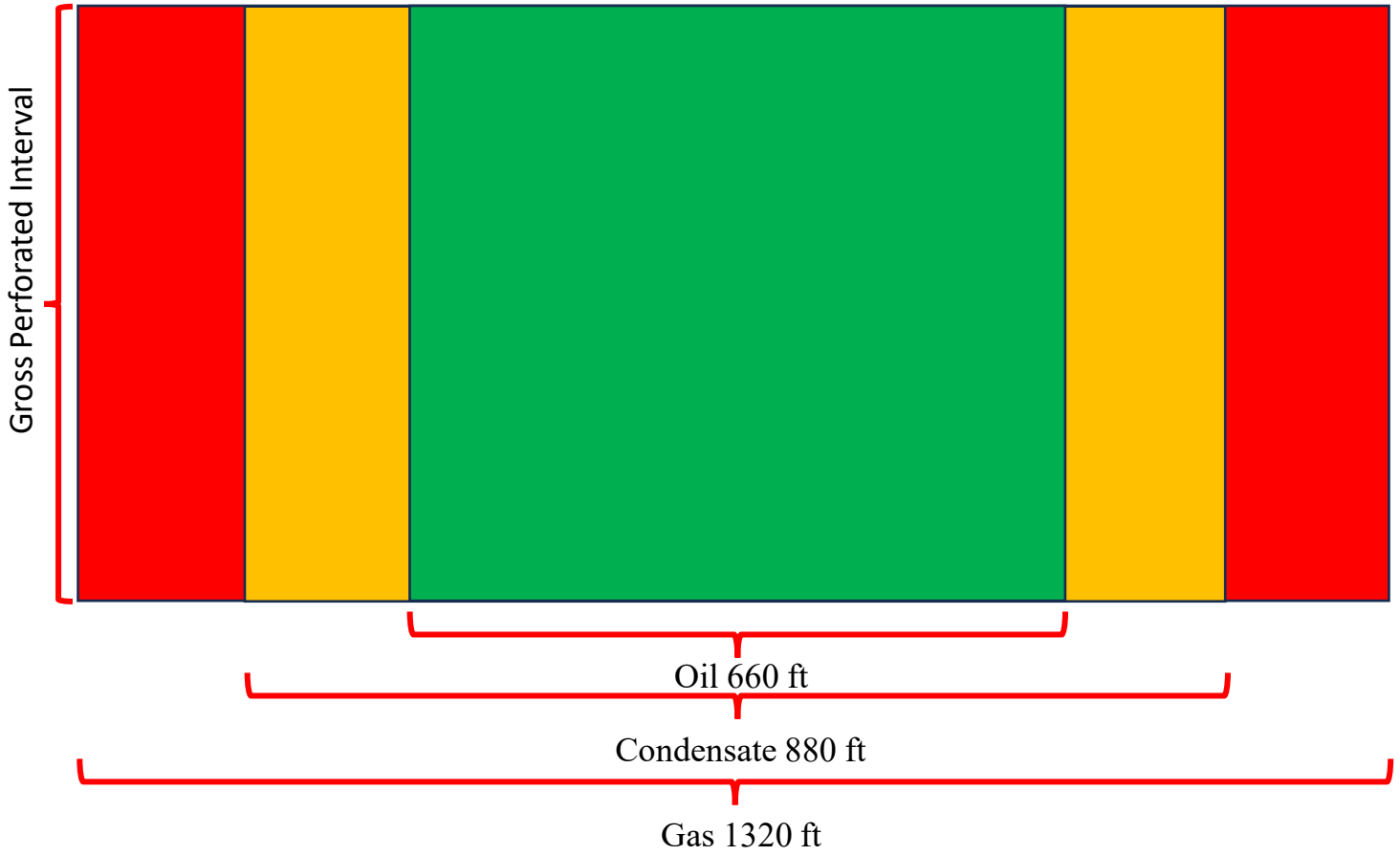
# Well Spacing vs Max Recovery Factor Oil Windows




Max RF = 0.0002121 * spacing ft
14% for spacing >= 660 ft

Eagle Ford and Permian Data

# Drainage Area Assumptions



# Refrac Wellbore Preparation

- Mechanical isolation preferred over bullheads, expandable liners or cemented flush joint
- Proper wellbore cleanout and preparation important
- “Best practices” recommended by active refrac operators:
  - Dark Vision or EV logging suite for borehole integrity
  - Pressure test casing above proposed liner top depth
- COP and DVN 95% success rate running mechanical isolation, may occasionally move liner overlaps based on mechanical integrity of the existing casing

# Refrac Execution“Best Practices”

- In 5.5 inch original casing recommend 4.25 inch expandable liner (4.1 ID) vs 4 inch flush joint (3.4 ID)
- Single 0.5 inch zero degree phased perforation per cluster
  - Cannot run in 4 inch flush joint need 3 1/8 guns
  - 15% higher cluster efficiency single vs dual perfs per cluster
- 25 ft cluster spacing to avoid legacy well longitudinal frac
  - Number of clusters = total rate/6 BPM per cluster
- Microproppant (fly ash) at least in the prepad for NWB friction reduction, possibly higher volumes in treatment
- 3000 psi pressure drop w/bioballs on standby if FDIs seen

# Transform Your Stranded Oil & Gas Assets into Profitable Income Streams with Triple R Energy Partners

TRIPLE R Energy Partners

Reducing Refrac Risk™


- Robert Barba and Mark Fleming

- September 27, 2023

# Providing Expertise and Capital to the Refrac Market

### Evaluate:

We technically assess all of your wells and identify the top refrac candidates

### Plan:

Together we'll put together a project plan to define scope, technical guidelines and well selection

### Finance:

Next we'll define the financial terms for our investment and working interest ownership share (ideally 75%)

### Implement:

Operator will maintain control of the well operations and provide all operational and administrative services

### Profit Share:

Once the well is back on production, profits are shared per the agreed-upon terms. Operator can buy back the WI after payout

TRIPLE R Energy Partners

# Requirements for Partnering with RRR

- Refrac candidate has to be economic, > P50 EUR >3:1 cash ROI
  - Parent wells no economic cutoff if pad offered as second refrac opportunity
- Farm in minimum one initial well (parent with at risk DUC ideal) to have everyone on the same page with “best practices” and operations
- Subsequent to first well one pre-H2 2016 pad is requested (if 4 or more wells), two pads if less than 4 wells on first pad
- 75-90% of operator’s working interest requested, need other WI partners approval no non-consent issues
- After 1.5x payout operator can buy back the working interest at a PV10 valuation from an independent 3rd party approved by all parties
  - PV10 of production prior to refrac subtracted from buyback total
- RRR participation in subsequent wells welcome but not required