Terminal Decline Considerations in A&D Evaluations

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WHO…?

"Who's on first?"

WHO…

- …is the seller?

- …performed the data room evaluation and terminal decline estimation?

WHAT…?
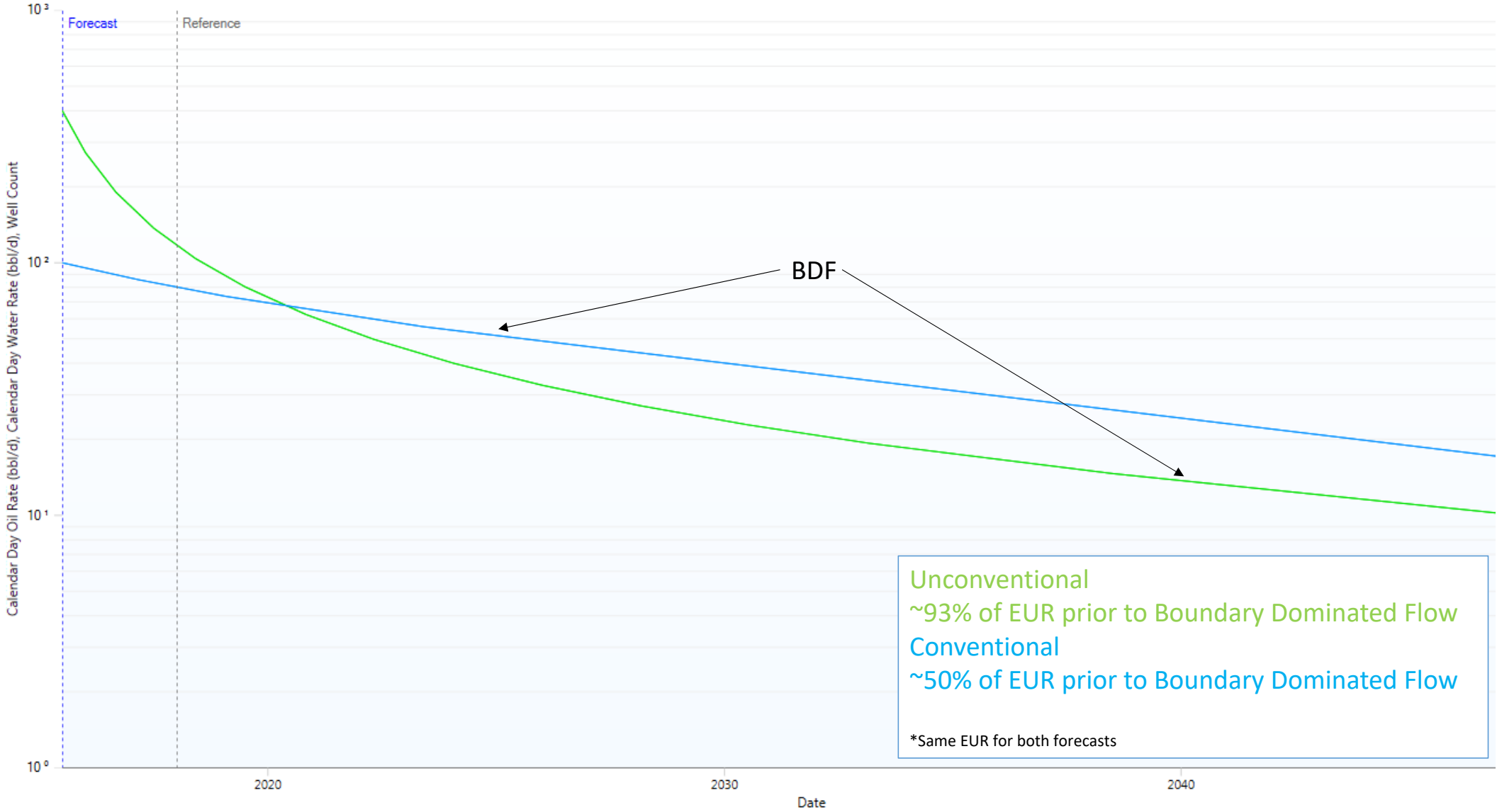

"What's your damage?"
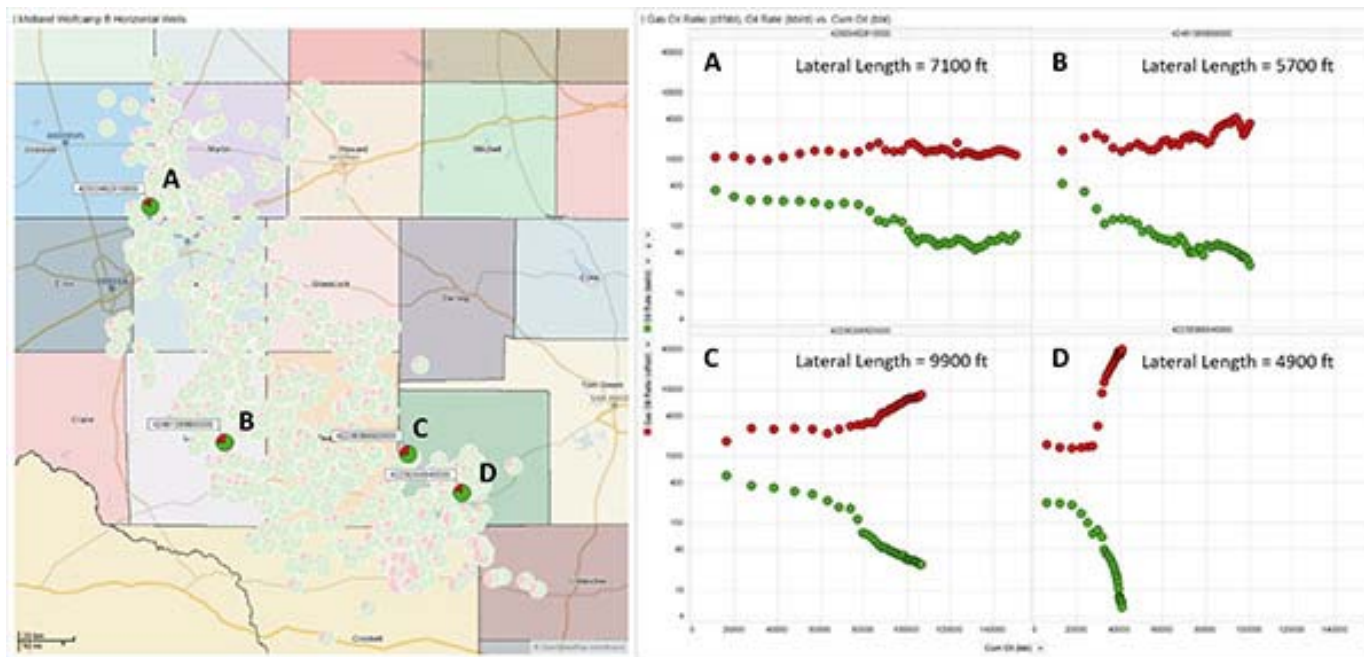
WHAT…

- …are we potentially buying?

- …type of reservoir(s) and drive mechanism?

- …is the product mix now and expected over the life of the project?

- …what's its damage?

Product Mix in Midland Basin

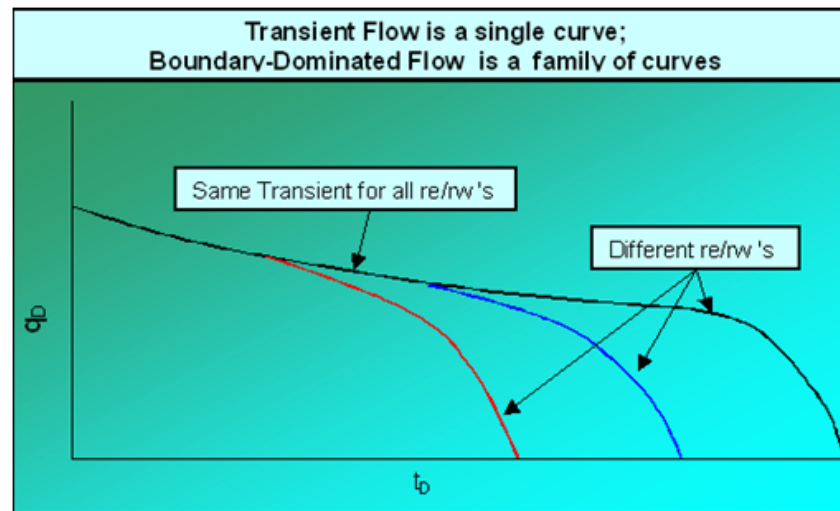From "Death by Bubble Point", Dr. John Lee, SPE HEES 2018

WHERE...?

"Where we're going, we don't need roads."

WHERE…

- …are the future development and re-development opportunities located with respect to the existing wells and do we anticipate interference, i.e. infills, step outs?

www.fekete.com

WHY…?
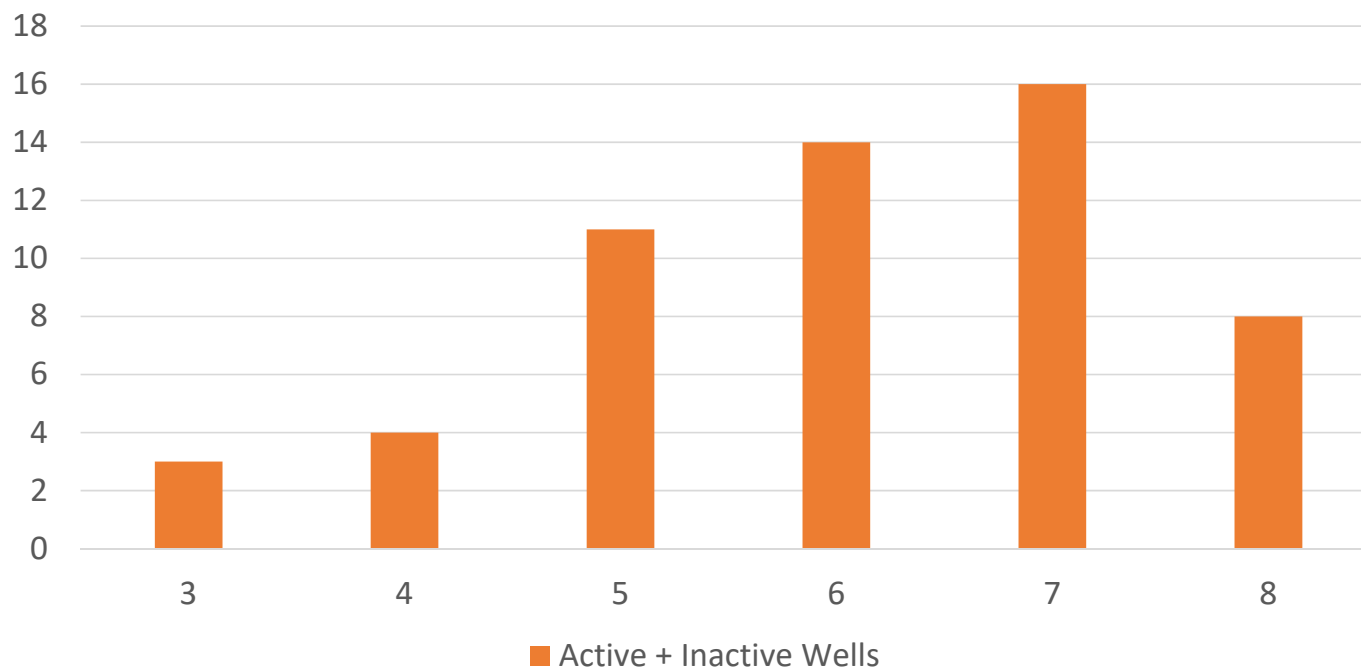

"Atreyu, why do you look so sad?"

WHY…

- …should we include/exclude certain wells when estimating terminal decline?

- …should/could we use vertical wellbores as a proxy for horizontal terminal decline estimation?

- …have existing wells become inactive in the past?

Estimated Terminal Decline

Active + Inactive Wells

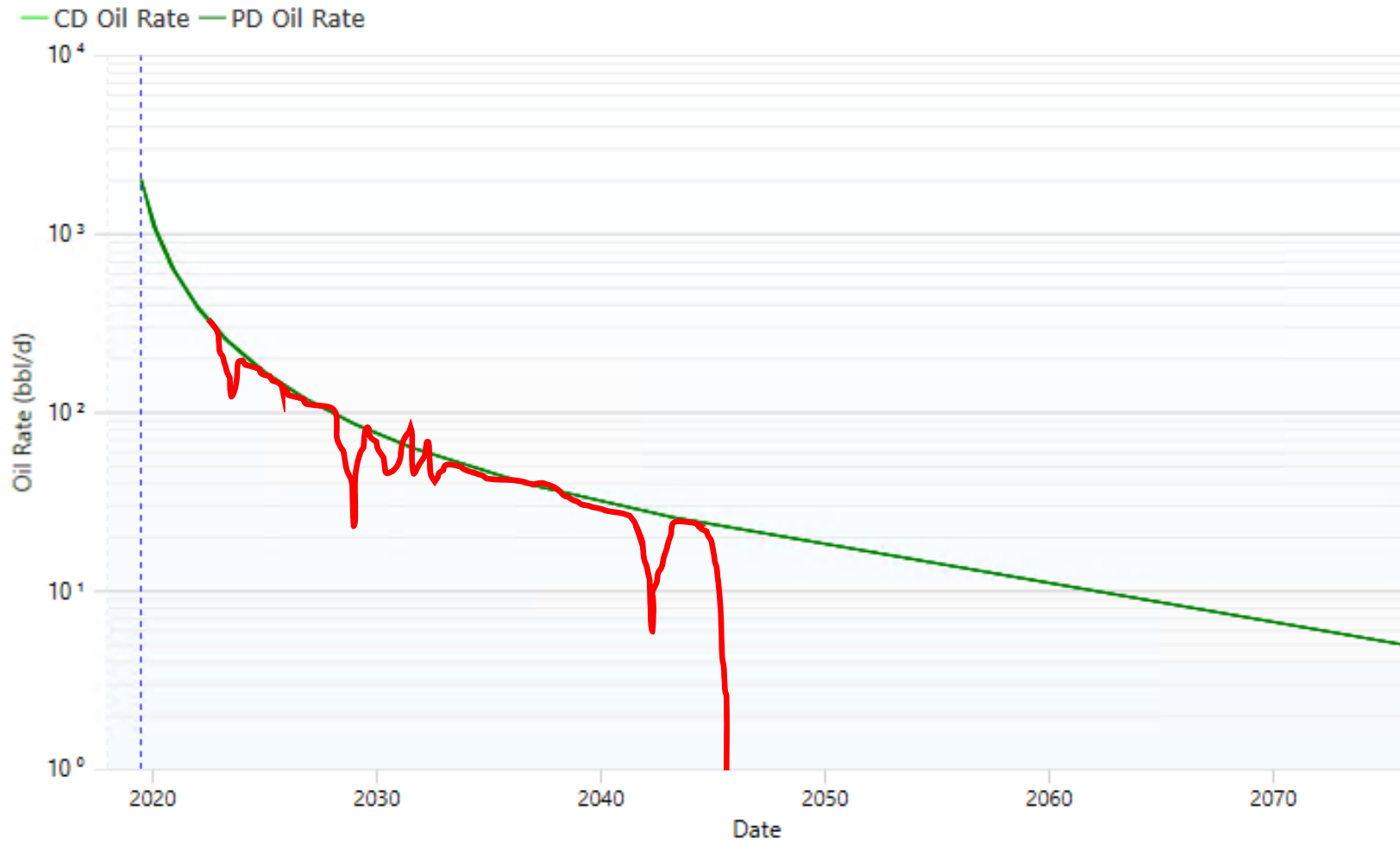# HOW…?

"How far is Minas Tirith??"

HOW…

- …did previous operators drill & complete these wells?

- …are the wells being produced now and likely to be produced in the future?

- …much opex/capex are associated with achieving the terminal decline expectations?
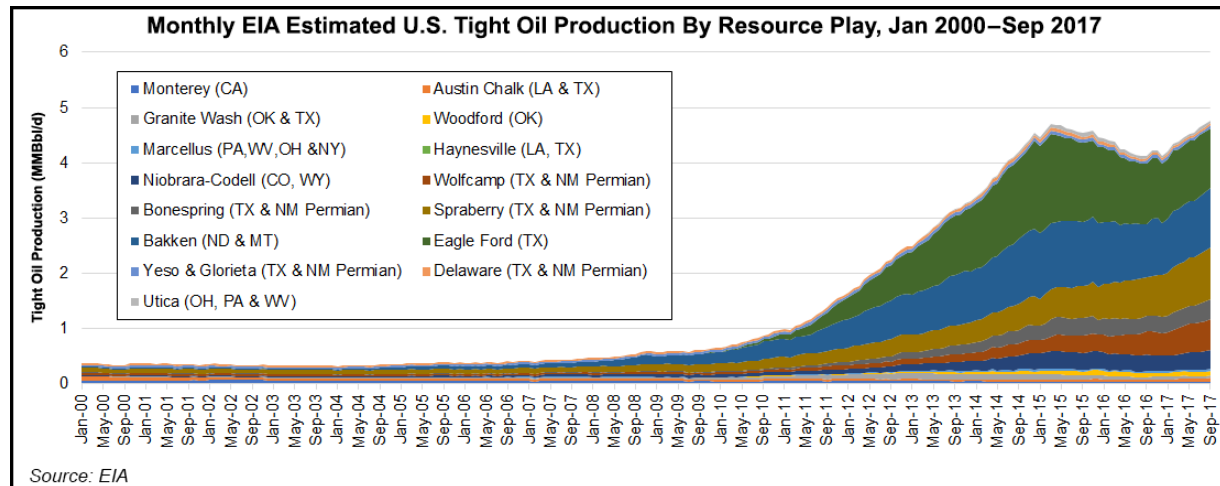
WHEN...?

"When and where does this 'real world' occur?"

WHEN...

- ...in the field's life cycle are we purchasing?

- ...will we produce the forecasted volumes and incur the costs?

Monthly EIA Estimated U.S. Tight Oil Production By Resource Play, Jan 2000–Sep 2017

Source: EIA

www.naturalgasintel.com

Hypothetical Unconventional Oil Opportunity

Project Rock Chalk

Key Stats

- 100% WI / 75% NRI
- 2000 bopd IP
- 120% nominal decline
- 0.7 b factor
- $7.5MM development capex
- $7500/well-mo fixed opex
- $10/bo variable opex

Sensitivities

- Terminal Decline
- WO capex
- Maturity
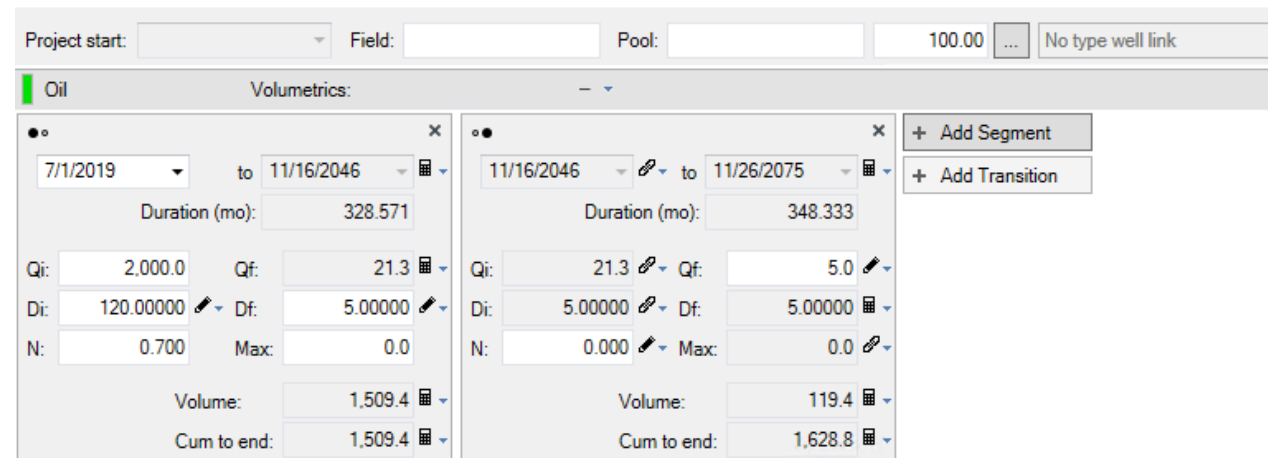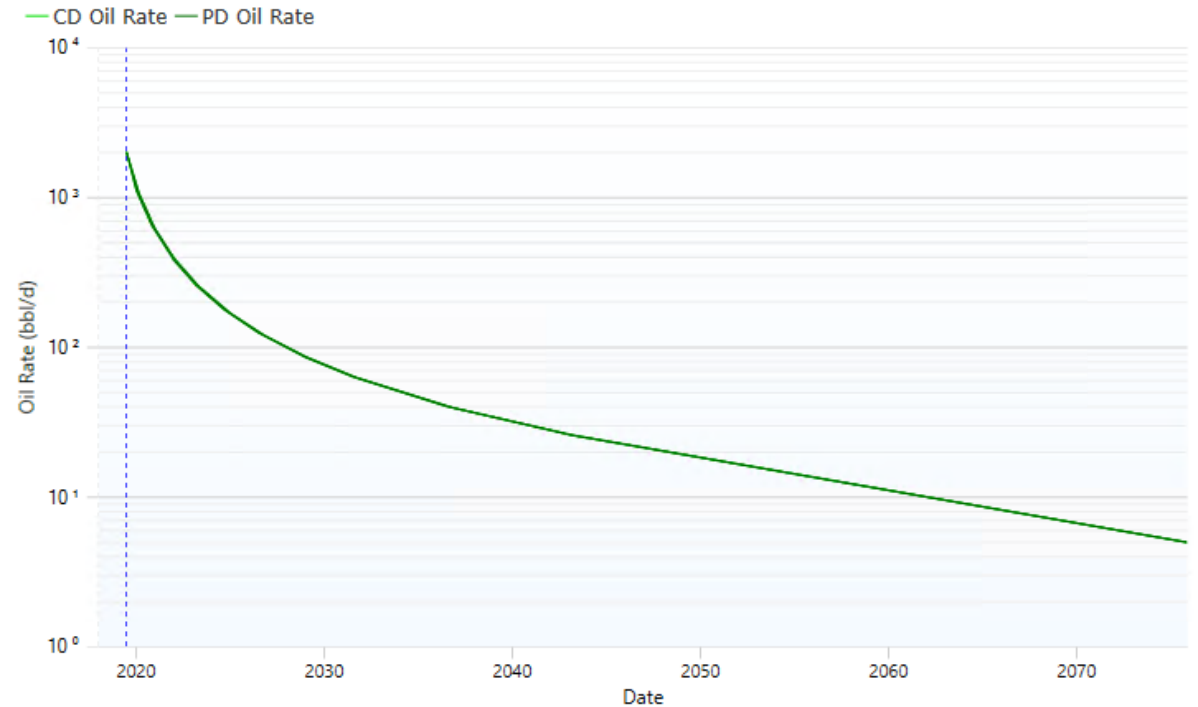
Terminal Decline Sensitivities

Terminal Decline	Reserves MBOE	NPV10 M$
5%	1,206	22,445
7%	1,175	22,422
10%	1,133	22,335
14%	1,082	22,119
Difference 14% to 5%	**-10%**	**-1%**

Maintenance Capex Sensitivities

WO Capex	Reserves MBOE	NPV10 M$
None (Base)	1,133	22,335
$150M / 4 years	1,127	22,020
$150M / 2 years	1,113	21,767
$300M / 2 years	1,093	21,228
Difference Max to Base	**-4%**	**-5%**

Maturity of Project at Acquisition Date

Monthly EIA Estimated U.S. Tight Oil Production By Resource Play, Jan 2000–Sep 2017

Legend:
- Monterey (CA)
- Austin Chalk (LA & TX)
- Granite Wash (OK & TX)
- Woodford (OK)
- Marcellus (PA,WV,OH &NY)
- Haynesville (LA, TX)
- Niobrara-Codell (CO, WY)
- Wolfcamp (TX & NM Permian)
- Bonespring (TX & NM Permian)
- Spraberry (TX & NM Permian)
- Bakken (ND & MT)
- Eagle Ford (TX)
- Yeso & Glorieta (TX & NM Permian)
- Delaware (TX & NM Permian)
- Utica (OH, PA & WV)

Y-axis: Tight Oil Production (MMBbl/d)

Source: EIA

www.naturalgasintel.com

Maturity of Project at Acquisition Date

Years from Initial Development	5% Terminal Decline		10% Terminal Decline		Difference 10% to 5%	
	Reserves MBOE	NPV10 M$	Reserves MBOE	NPV10 M$	Reserves MBOE	NPV10 M$
None (Base)	1,206	22,445	1,133	22,335	-6%	0%
2.5 Years	620	12,299	548	12,152	-12%	-1%
5.5 Years	410	6,881	337	6,686	-18%	-3%
10.5 Years	255	3,599	183	3,285	**-28%**	**-9%**

# Potential Implications of Terminal Decline Estimation Bust in A&D

- Over/under bid for acquisition

- Opex/capex KPI target misses

- Production volume/mix misses

- Reserves write downs and asset impairments

- DD&A implications

Conclusions

- Terminal decline is a larger driver in A&D evaluations when:

  - Reservoir achieves BDF sooner (i.e. conventional)

  - Reservoir is further along in its maturity

  - Interference from down spacing observed

  - Higher costs required to achieve the theoretically feasible terminal decline

DISCUSSION?
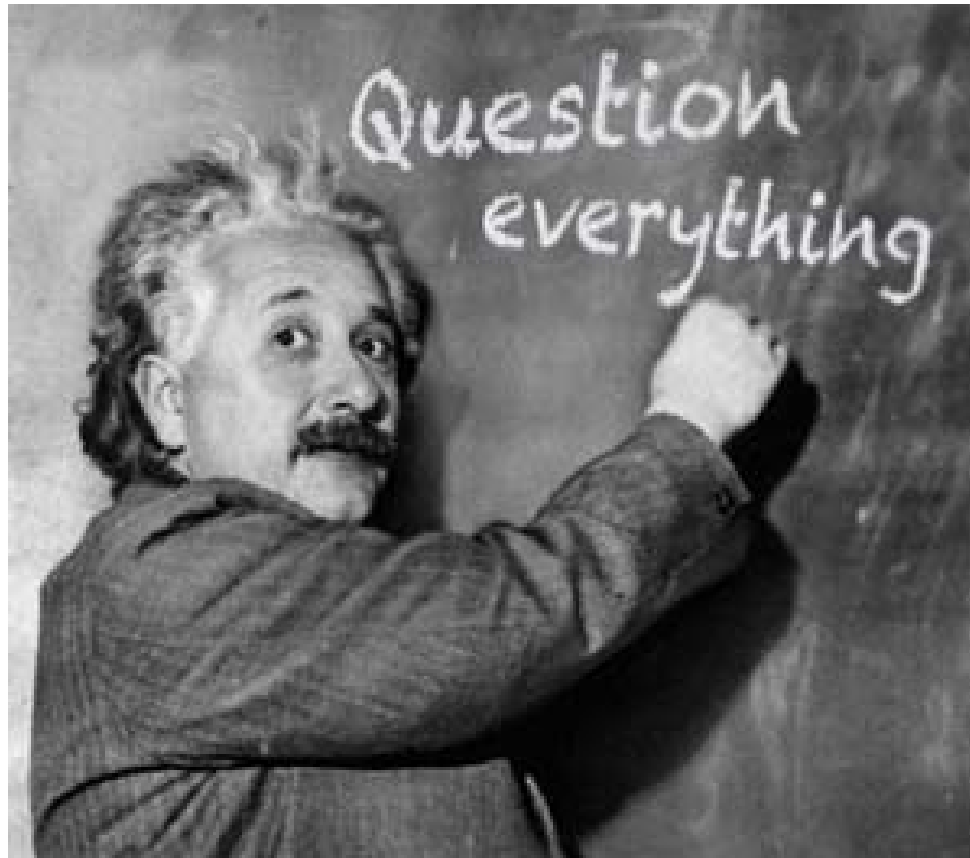
BACKUP

BOOK VALUE AND DD&A

- Book value of PP&E represents (historical) costs incurred to acquire or develop assets, including successful exploration costs, ARO and capitalized interest, net of accumulated DD&A and impairment (pp. 68-69, 100)

- DD&A is based on historical costs going back many years, so will reflect necessary investment required to sustain reserves based on mixture of present and potentially very historic costs – poor benchmark for changes in real asset value

- DD&A using unit of production method

- Proved reserves and production volumes used as basis for recording DD&A

BOOK VALUE AND DD&A (Continued)

- $$\frac{Unamortized\ Costs}{Proved\ Reserves} \times Production\ for\ Period$$

DD&A COMPUTATION

Illustration 1	
Unamortized Costs	$750,000
Estimated Reserves – beginning of period	1,000,000 bbls
Production during period	40,000 bbls

$$\frac{\$750,000}{1,000,000\ bbls} \ x \ 40,000 \ bbls = \$30,000$$

DD&A COMPUTATION

Illustration 2 (significant reserves revision)	
Unamortized Costs	$750,000
Estimated reserves – beginning of period	$1,000,000 bbls
Production during period	40,000 bbls
Estimated reserves – end of period	560,000 bbls

$$\frac{\$750,000}{560,000\ bbls + 40,000\ bbls} \times 40,000\ bbls = \$50,000$$