Forget BOE, Let's talk about "BOV"

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The conventional barrel of oil equivalence ("BOE") no longer suits the purpose for which it is used.

Odd as it is, one of my first projects as an engineer was comparing methods to calculate barrel equivalence. The problem lies in the vast differences between the products, and that problem has since grown worse and now disfigures comparisons between products.

I and the team compared various physical properties, such as the ubiquitous energy equivalence and the physical conversions, as well as value equivalence measured by price. The average intrinsic properties appealed for their inherent constancy. The price equivalence, though more practical, was also more volatile. On average the price ratio did not differ greatly from the more physical ratios. In that epoch, oil was still oscillating around $20, mostly 6 to 10 times the price tag on gas. NGLs didn't join the discussion at all, and our team concluded in 1995 that the standard energy equivalence of 6:1 gas to oil made enough sense for discussion purposes.

The 6:1 convention lost its utility years ago. Today, we have a much longer market history for natural gas, and implied substitution cannot force price ratios to revert toward energy ratios. Now, the demand markets are cleanly separated, the products are not fungible, and the prices are completely disconnected. Plus, oil prices moved systematically up while gas prices and the relative value of NGLS both moved systematically down.

	black oil	wet gas	
Oil	**900**	**200**	**BO/d**
Gas	660	7,200	Mcf/d
NGL	200	420	B/D
BOE	**1,210**	**1,820**	**BOE/d**
BOV	**1,000**	**700**	**BOV/d**

Figure 1: Example comparison of daily rates using different equivalencies.

As oil and gas prices diverged, natural gas liquids (NGLs) entered the discussion as a major separate driver of value, and it inherited the obvious conversion ratio of 1:1. Both oil and NGL do physically exist in liquid form can be measured in the same units, never mind the fact that the price tag on real-world NGL blends has never approached that of crudes. Adding difference, the effective value of NGLs falls lower, too, since a producer must pay for extra processing.

Meanwhile, companies have increasingly turned to barrels of oil equivalence (BOE) to summarize and compare well results, especially to investors, across plays. Three products, it seems, are too many to compare. At this point, the conventional BOE equivalence no longer suits the purpose for which it is used.

Energy/volume equivalence dramatically inflates the appearance of value from gas and gas liquids in all wells but especially in gassy wells. As demonstrated in the examples above, the energy equivalence paints a markedly different picture from the value equivalence.

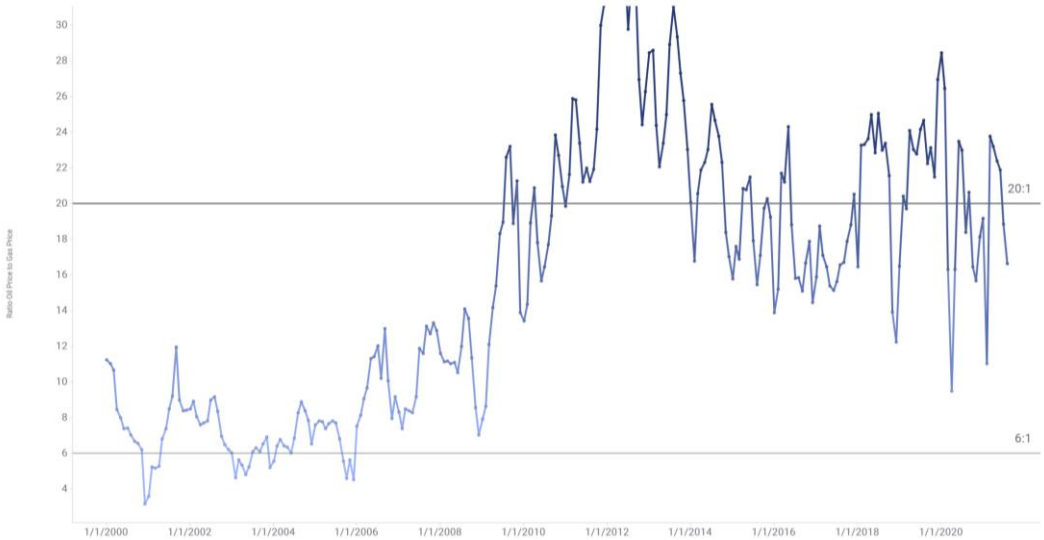
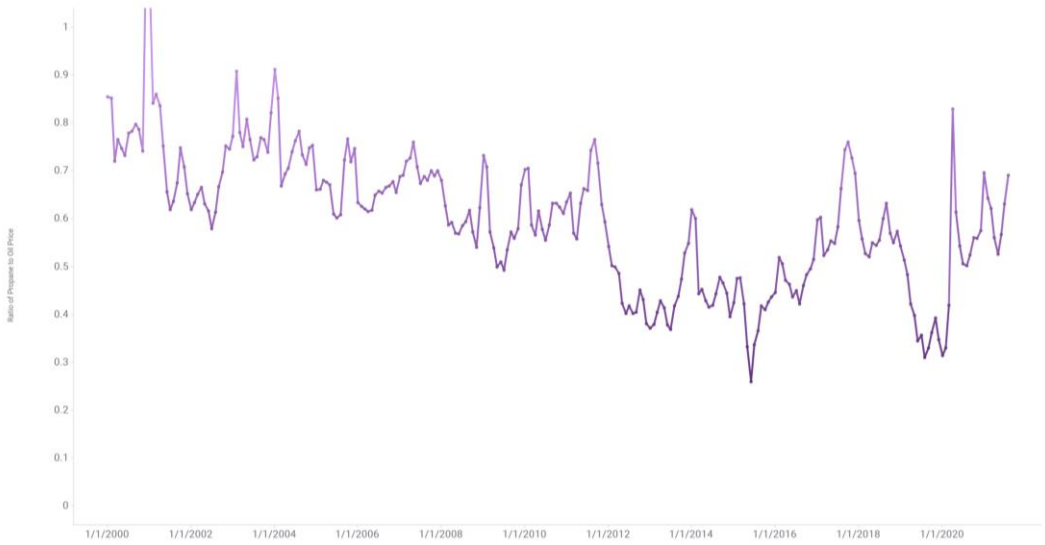


Figure 2: History of oil to gas price ratio in U.S. since 2000.

Figure 3: History of propane to oil price ratio in U.S. since 2000.



The table above uses my proposal for a new shared equivalence. I propose that our industry talk about "BOV" (barrels of value) to replace "BOE" (barrels of energy), namely 20 MMBtu:1 bbl and 3 NGL bbl: 1 oil bbl. Stated more efficiently, 20:3:1. Granted, these ratios will not endure forever, and a value equivalence may need to be reset or at least stated explicitly. Until then, however, these price ratios are much more relevant, and will likely continue to be better, than energy equivalence.

		Oil price ($/bbl)						
		$45	$50	$55	$60	$65	$70	$75
Gas Price ($/MMBtu)	$2.00	13%	25%	38%	50%	63%	75%	88%
	$2.50	-10%	0%	10%	20%	30%	40%	50%
	$3.00	-25%	-17%	-8%	0%	8%	17%	25%
	$3.50	-36%	-29%	-21%	-14%	-7%	0%	7%
	$4.00	-44%	-38%	-31%	-25%	-19%	-13%	-6%
	$4.50	-50%	-44%	-39%	-33%	-28%	-22%	-17%

Actual Netback (% of crude)	20%	25%	30%	33%	40%	45%	50%
Error created by using 3:1	67%	33%	11%	0%	-17%	-26%	-33%

Figure 4: Error of BOV price equivalence assuming various prices.

The tables above show how various combinations of commodity prices compare to the proposed conversion heuristics, all with substantially less error than the roughly 300% error created currently by BOE. Users could, alternatively, clarify to readers the exact ratio they have used to reflect local conditions significantly different from the heuristics e.g., 25:2:1 or 15:3:1.

We can use the better comparison only if we can agree on the comparison, so I encourage you to socialize this idea. From now on . . .

- "BOV" means barrels of value at a conversion rate of 20:3:1.
- "BOE" means barrels of energy at a conversion rate of 6:1:1.

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