# For What It's Worth - Establishing the Value of Crude Oil Storage in the Shale Era

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Here at RBN, we frequently receive questions about our thoughts on the value of storage. Whether it be crude, natural gas, or NGLs, we answer like any good consultant, "It depends." What operational need does this storage serve? Where is it located? Does it have optionality for receipts and deliveries? These factors and many more can affect both the strategic and tactical value of a storage asset. Those assets that are integrated into midstream systems and facilitate movements from the upstream to the downstream are generally better poised for success. Those attempting to carve out a niche in isolation or relying on uplift purely from commodity price fluctuations … well, good luck to them. Today, we begin a series examining the value of — and changing markets for — crude oil storage.

Crude oil storage is an integral part of the midstream sector, which (as its name suggests) occupies the market midway between the upstream production of crude and other hydrocarbons at the wellhead and the downstream refining or exporting of oil. As such, the role of crude storage is to facilitate the transfer of oil as it works its way down the line from the lease to the refinery or export dock. That includes moving the various grades of oil across distances, from Point A to B, over a period of time — days or a month or more — as price differentials and economics dictate. This is an important distinction because it means that midstreamers must employ different strategies to capture value in dynamic markets than buyers and sellers in the upstream and downstream sectors. Over time, upstream and downstream folks have had to adapt to manage the commodity price risk that they face. They've accomplished this through a variety of financial instruments and physical trades, including a combination of term contracts, spot transactions, physical forwards, futures, options and other derivatives.

In contrast, the midstream sector — by its nature as an intermediary — has less outright exposure to crude oil price risk. Rather, the challenge for midstreamers has been to serve the upstream and downstream sectors as efficiently as possible so they can generate capital to be reinvested in their businesses. Traditionally, the midstream industry's best-known, most talked about components — pipelines — have utilized long-term agreements with their upstream and downstream counterparties to monetize the value of their assets. And so it has been with crude storage capacity, where the pricing of incremental months of storage that producers, shippers, marketers and refiners expect to need to conduct business efficiently has generally been based on multi-year contracts that underpinned the initial development of that capacity. The obvious reason for this is that long-term infrastructure investments require long-term commitments to attract capital.

A key — and in some ways obvious — question is, what happens to these midstream assets after the initial long-term contracts expire? Equally important, what happens when the underlying dynamics of the market change, such as major shifts in upstream supply and/or downstream demand? Also, how does the market value the optionality of storage, based on its physical characteristics, at any given point in time? In this blog series, we will look to the changing nature of how crude oil storage is valued, but, before we do so, we will review the roles that storage plays as crude works its way from the lease to the refinery or export dock.

The special nature of each storage asset is a function of many variables, including its position somewhere between the production well and the downstream consumer, its connectivity, and its operational flexibility — and these factors, among others, are integral in determining how the operator extracts value from that asset. At the production area, tanks are used to settle out and separate water and sediment from the crude prior to shipment. Then, for those wells without reliable access to sufficient egress, the tanks in production areas can serve to balance produced volumes with the takeaway capacity. Upstream storage can also be used for quality segregation or blending operations (more on this topic below), including for the purpose of meeting pipeline specifications. From a pipeline operations point of view, storage capacity allows for the queueing of batches to send down long-haul pipelines. (We described the dynamics of batching in Easy to Be Hard.) Storage also facilitates the efficient transfer of batches of crude between pipeline systems.

"Guitar Lake" at Magellan Midstream Partners' Tank Farm in Cushing, OK. Source: Genscape

Looking at it from a commercial perspective, large amounts of crude oil storage located in certain areas along the routes between production regions and refineries and/or export terminals can provide liquid trading points — that is, convenient spots at which marketers can bid, offer, and transfer title of their barrels. Liquidity at a trading hub is typically a function of the volume of transactions at that hub. The more trades that are done at a hub, the better the chances of finding a counterparty you can do business with. So, all things being equal, the more storage that exists at a centralized point — the hub at Cushing, OK (see photo above, provided by our good friends at Genscape, of Cushing's "Guitar Lake." Rock and Roll.), with more than 90 MMbbl of storage capacity being a prime example — the more attractive that location is as a point of trade. (Last year, in the eight-part series Oklahoma Swing, we discussed the dynamics around capacity, interconnectivity and the important role that Cushing still plays.)

Once their barrels are deposited at a major storage location like Cushing (or Midland or a number of other hubs), marketers have the option to pivot their barrels to whichever end-market nets them the highest value for their oil. For example, consider a Permian WTI barrel that made its way up to Cushing, was put in storage, and is slated to head down on the Seaway pipeline system to an export terminal on the Gulf Coast. The seller learns that a coker outage at a Texas refinery has increased the price that the refiner is willing to pay for the barrel that was to be exported and jumps at the chance for a higher return, and other barrels held in storage at Cushing are substituted to meet the export demand. Another option for marketers seeking higher value would be to take advantage of the opportunities to be found in a blending arbitrage. For instance, traders might look to take light crude with a high API gravity and blend it with heavy Canadian barrels to provide a barrel that will yield better value for certain refiners. We'll discuss these and other examples at length in an upcoming episode in this blog series.

As crude oil barrels move into market areas — namely, locations with refineries and/or crude export terminals — storage takes on somewhat different roles. For refineries, storage is used to help stage the delivery of crude for refinery runs, and to help companies mitigate the impact of refinery swings. For exporters, crude oil storage is necessary to accumulate loads for tankers, and thereby enable those tankers to be filled quickly when they dock. Segregated storage tanks allow for barrels with different API gravities and sulfur and metal content to be marketed to refineries configured to run on specific crudes. Given the variability in quality among producing basins, refiners want to ensure that the characteristics of the crude they receive matches closely with what they expected. This has come to the forefront as the U.S., has become a major crude exporter; Asian refiners in particular have been willing to pay a premium to guarantee a barrel that meets the fine-tuned specifications that the seller has committed to them.

Given the steep rise in U.S. crude oil production over the past decade, it should come as no surprise that midstream companies and others have been adding significant amounts of crude storage capacity over the same period. Figure 1 shows that, as you'd expect, the vast majority of this new capacity is being built in Petroleum Administration for Defense Districts (PADDs) 2 and 3 (the Midwest and Gulf Coast, respectively). PADD 2 (pink layer for Cushing and red layer for the rest of the Midwest) and PADD 3 (blue layer) are where most of the production growth has occurred (the Permian, the Bakken, SCOOP/STACK and the Eagle Ford); PADD 2 is where the Cushing hub is located, and PADD 3 is where most of the U.S.'s refineries and all of its major crude export terminals are sited. Smaller amounts of new storage is being added in PADD 4 (the Rockies, purple layer), home to the Niobrara's Powder River and Denver-Julesburg (D-J) basins; storage capacity has remained largely static in PADD 1 (East Coast; light blue layer) and PADD 5 (West Coast; yellow layer).

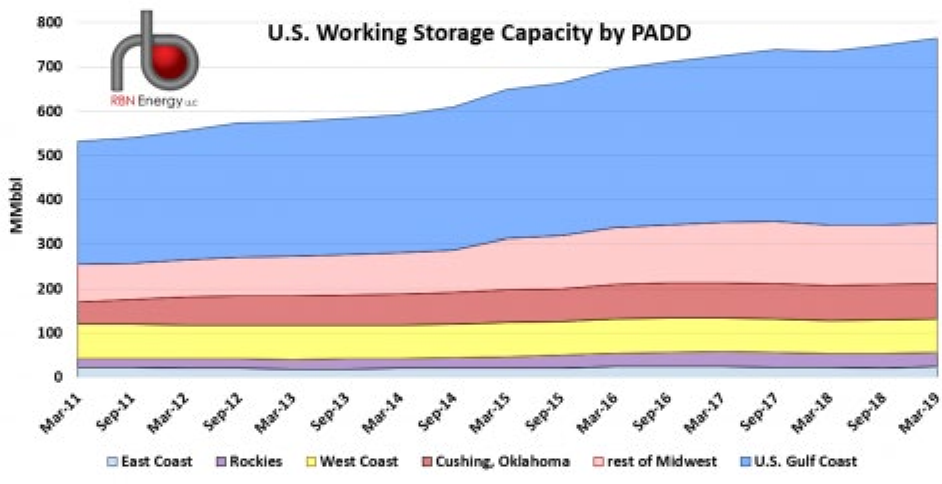

Figure 1. Crude Storage Capacity by PADD, 2011-19. Source. Energy Information Administration (Click to Enlarge)

The buildout of crude storage capacity continues, especially along the Gulf Coast — the destination for most of the crude being produced in the Permian — with much of it tied to planned export terminals or expansions to existing terminals. Having discussed in general terms the importance of crude oil storage capacity and the various roles that storage plays depending on its location, we will next turn our attention to how the value of storage capacity is determined — we'll do that in Part 2.