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Green Light – Strong Demand for Gulf Coast Natural Gas Storage Boosts Brownfield and Greenfield Projects Alike

Expansions at Existing Sites to Be Followed by Projects at New Ones



- **Gulf Coast LNG exporters, power generators need a lot more natural gas storage space**
- **Salt cavern storage typically offers the highest injection and withdrawal rates**
- **By leveraging existing infrastructure, brownfield expansions cost less to develop**
- **But expansion opportunities are waning, opening the door to greenfield projects**
- **The competition among developers to provide the next tranche of space is fierce**

1. Introduction

At first glance, you might think that surplus gas storage space from a massive overbuild in the 2000s and the ongoing expansion of several existing salt cavern storage facilities along the Gulf Coast would be more than enough to meet the increasing needs of LNG exporters, power generators and others in the region. After all, brownfield projects with a combined capacity of about 120 Bcf have been sanctioned in Texas, Louisiana and Mississippi the past couple of years and are now moving toward completion.

But gas storage customers have indicated that they will need far more than that by the early 2030s. And, with expansion opportunities at brownfield sites dwindling, the need for at least a few large-scale greenfield projects has become apparent, and a fierce competition to line up long-term commitments for storage space has emerged among a half-dozen developers, many of them

backed by private equity. One 12.5-Bcf greenfield project has already reached a final investment decision (FID) and developers have indicated that they expect to pull the trigger soon on plans for more than 200 Bcf of additional storage space.

Do the math and, yes, it seems likely that within the next five or six years, the Gulf Coast will have some 300 Bcf more gas storage capacity than it does today.

1.1 How did we get here?

Just a few years ago, gas storage capacity along the Gulf Coast was widely available at low cost, but that has all changed. The operators of existing and planned LNG export terminals have locked up most of the old storage surplus and much of the incremental storage capacity on the drawing boards. More storage is needed, and the scale is enormous.

There are several drivers behind this ongoing, multibillion-dollar buildout, chief among them (1) the proliferation of new and expanded LNG export terminals in Texas and Louisiana and (2) terminal operators' need for a place to quickly store large volumes of gas in the event of a liquefaction plant outage. This is key: Without nearby storage capacity to serve as an at-the-ready buffer for gas supply, terminals could expose themselves to major financial losses, either by not having the gas they need to operate or, most ominously, by being forced to dump billions of cubic feet of gas into the market during an outage event. In essence, gas storage serves as relatively low-cost insurance.

To a lesser degree, new gas storage capacity is also needed to manage gas flows along the Gulf Coast, which have increased sharply in recent years due to Permian gas production growth and new LNG export, industrial and power demand. Power generators — many of them tied to planned AI data centers — need backup sources of gas supply if regional gas and power demand soars or traditional supplies are interrupted.

As we said, Gulf Coast gas storage capacity saw a massive overbuild in the late 2000s. There were two major catalysts. First, the Energy Policy Act of 2005 provided that if a storage owner could show a lack of market power, its rates could be "market-based," attracting more marketers and traders into the storage game. Second, back then almost everyone thought that the U.S. was running out of natural gas and would soon have to rely on huge volumes of LNG imports to keep pace with demand — and that gas storage would be needed to receive and manage those imported volumes.

Instead, the Shale Revolution happened, and gas production in the Permian, Haynesville and other U.S. shale plays grew by leaps and bounds. By the 2010s, the Gulf Coast had way more gas storage capacity than it needed and storage rates plummeted. As we all know, several of those LNG import terminals in Texas and Louisiana were repurposed as LNG export facilities, new liquefaction plants were built, and the Gulf Coast quickly ramped up the volumes of LNG it was sending out.

The new LNG export capacity was welcome news to gas storage owners, whose previously underutilized facilities were suddenly a hot commodity. LNG terminal operators quickly locked up the storage space they needed and, as you would expect, storage rates started to rise. (More on storage rates to come.)

1.2 A new wave of LNG export projects

More recently, a second wave of LNG export projects in Texas and Louisiana has been advancing to FID, financing, construction and, in a few cases, operation. LNG terminal operators with liquefaction/export capacity coming online in 2026-28 have already secured almost all of the storage space left from the last boom-and-bust cycle and, once that was spoken for, entered into long-term commitments with developers to underwrite much of the

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buildout of new gas storage capacity in the region, most of it expansions at existing (i.e., brownfield) storage facilities. Many of those storage projects are now being built.

Still more storage capacity will be needed, however, and the developers of LNG export projects coming online in 2029 and beyond are scrambling to line up capacity at storage projects that have not yet reached FID.

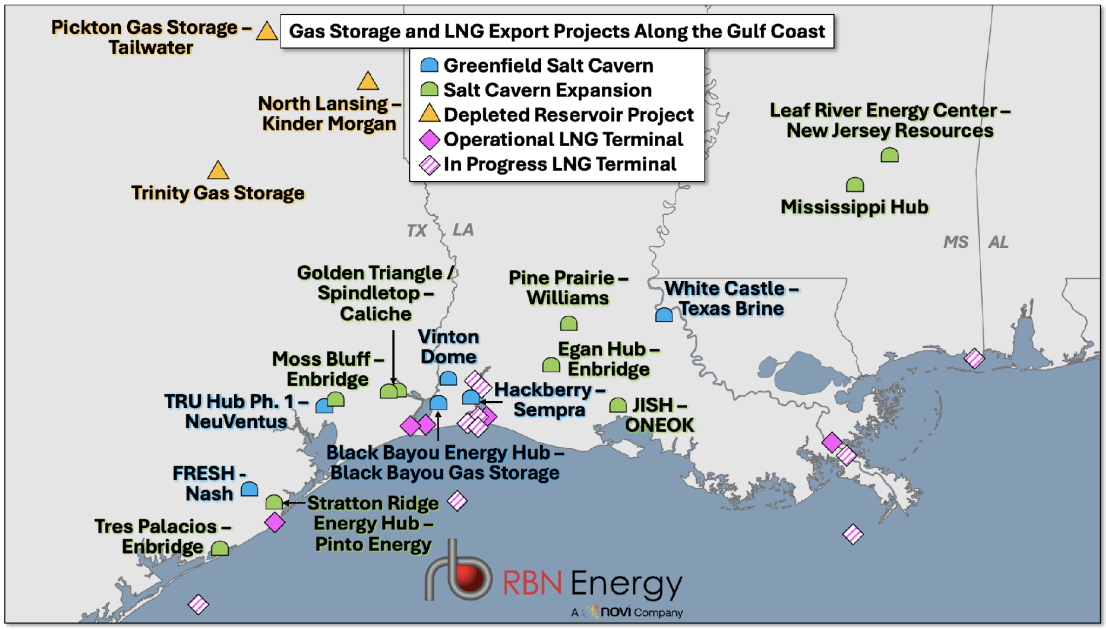

Figure 1. Gas Storage and LNG Export Projects Along the Gulf Coast.
Source: Novi Labs

As shown in Figure 1 above, most of the incremental storage capacity under development is either expansions to existing salt cavern operations (green dome icons) or greenfield salt cavern projects (blue dome icons) between Enbridge's Tres Palacios storage operation in Matagorda County, TX, and New Jersey Resources' Leaf River site in east-central Mississippi — many of them near several existing and proposed LNG export terminals (solid and striped pink diamonds, respectively).

A handful of depleted gas reservoir facilities (orange triangles) have also been proposed, mostly away from the coast (and coastal salt deposits) in northeast Texas.

Salt cavern storage offers several benefits over depleted gas reservoir facilities. Most important by far, salt caverns offer considerably higher gas injection and withdrawal rates — a must-have for LNG export terminals and other customers that may need to "park" large volumes of gas within a short period of time. (That benefit comes in part from the fact that a salt cavern functions as a large underground tank, with gas flowing freely into or out of the cavern via the wellbore. In a depleted reservoir, gas is stored in microscopic pore spaces within sandstone or carbonate rock and doesn't flow in or out as freely.) Also, salt caverns require considerably less "base" or "cushion" gas — that is, the amount of gas that needs to remain within a storage facility to maintain pressure and physical integrity. Typically, a salt cavern needs only 20% to 30% of cushion gas, compared to 50% or more for a depleted reservoir.

1.3 Rising rates lift all projects

As we said earlier, LNG terminal operators, power generators, and utilities have already locked up most of the excess storage capacity that was left over from the decade-long period of overbuilding. The competition to secure the incremental storage capacity that will be needed

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for the current wave of LNG export development has been heating up, as evidenced by strong responses to storage-project open seasons and higher storage rates — as we'll get to, prices north of 20, 25 and even 30 cents per dekatherm (dth) per month are now common, compared to prices south of 10 cents/dth/month a few years ago.

The scramble for incremental gas storage space along the Gulf Coast doesn't mean that every pre-FID project will succeed in lining up the long-term commitments needed to make their economics work. Salt cavern storage development has always been an expensive and time-consuming undertaking, and in recent years the massive demand for compressors, piping and all kinds of other equipment has sent project costs soaring. That gives an economic edge to existing storage owners/operators and brownfield storage projects, whose costs can be minimized by the extensive use of existing infrastructure (i.e., header systems/gas-pipeline interconnections, compressors, water pipelines and brine ponds). In contrast, greenfield projects must start from scratch — though one we will discuss already has its salt caverns in place.

Other factors that impact a project's odds for success in the current environment include its location, size, connectivity to existing and planned gas pipelines — LNG export terminal operators typically want storage that is nearby and directly linked — and injection and withdrawal rates, which are important determinants in how much of a buffer the storage will actually provide.

To make economic sense, a storage project — brownfield or greenfield — needs to be underpinned by long-term commitments for Firm Storage Services (FSS) at rates sufficiently high to justify the investment. FSS rates are the fixed fee that customers pay each month under long-term contracts for the right to store X amount of gas at their facilities, whether or not they use it. (Note: In addition to that fee, customers pay volume-based fees for moving gas into and out of storage.)

In the second half of the 2000s, when large amounts of gas storage capacity were being built in anticipation of fast-growing LNG imports (something that never materialized, as it turned out), FSS prices were relatively high — north of 15 cents/dth/month (blue arrow in Figure 2 below). That price level not only supported the capacity buildout, it also reflected the wide winter-summer spread in gas prices, the high gas price volatility and the hurricane risk that drove the demand for more storage.

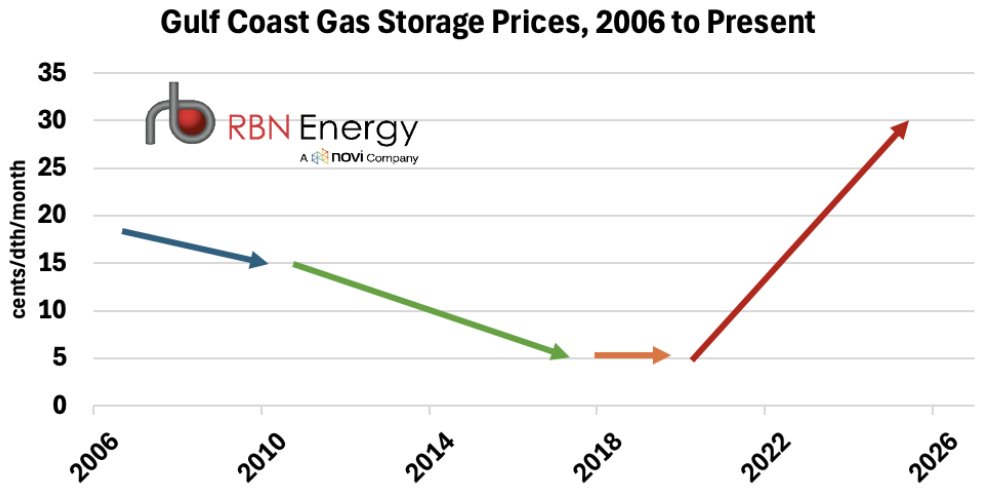

Figure 2. Gulf Coast Gas Storage Prices, 2006 to Present. Source: Novi Labs

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By the early 2010s, when it had become clear the region had far more storage capacity than it needed, storage prices started falling (green arrow), and by 2020 had bottomed out at only 5 cents/dth/month (orange arrow) — enough to cover storage owners' costs but not much beyond that. That started changing in 2021 with Winter Storm Uri, when freeze-offs paralyzed upstream wellheads and gathering lines and left Texas's electric grid starving for gas supply; gas storage facilities — at least those that still had power — went into overdrive, sending out vast amounts of stored gas and helping to avert a full-on grid collapse. Around the same time, the storage needs of new and expanding LNG export terminals were accelerating and terminal operators raced to lock in most of the surplus capacity that was still available. All that sent storage prices steadily higher — first past the earlier highs of 15 to 18 cents/dth/month and then past 20 and 25 cents toward 30 cents (red arrow).

This recent (and still ongoing) scramble for incremental storage space, almost all of it salt cavern projects, has been driven largely by LNG terminal operators. With their willingness to enter into longer-term deals and pay whatever is necessary (within reason) to get the storage space and injection rates they need, LNG terminal operators are driving today's gas storage market, but they aren't the only players. Operators of gas-fired generators (especially those tied to new or planned data centers) also need storage space and — more important to them than terminal operators — high withdrawal rates so they can quickly access gas supply if piped-in supplies are not available. The same is true for large industrial companies that consume large volumes of gas.

[An interesting side note: While LNG-related players can justify higher-priced storage rates as insurance against much larger operational losses, other market participants — especially marketers/traders that historically used storage for arbitrage — have increasingly been priced out of the new-storage part of the business. Instead, they are more likely to turn to lower-cost Interruptible Storage Services (ISS) that are often up for grabs on an "as-available" basis when not being used by FSS customers.]

So, to sum up, soaring demand for incremental salt cavern storage space — and, with that, sharply higher FSS rates — have spurred the development of more than a dozen major projects. Projects totaling about 120 Bcf have reached FID and another 200 Bcf or so in projects may be on the brink of being sanctioned. In this report, we will discuss these projects in some detail beginning with expansions at existing storage sites. After that, the report looks at the major greenfield projects in the works.

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