

Midstream Energy Investments

WHITEPAPER

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In this paper, we define and analyze the midstream energy investment opportunity. We examine the origins of the increasing demand for midstream investments, primarily from U.S. shale production. We also explore the three sub-sectors of midstream energy and how their revenue profiles differ from each other and upstream energy. With the opportunity set defined, we outline the ways to access midstream energy investments, investment characteristics, return potential, and role within a natural resource portfolio.

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What is midstream energy?

The oil and gas value chain is classified under three broad categories: Upstream, Midstream, and Downstream. Midstream encompasses all aspects of physically connecting the upstream assets, which are involved with exploration and production (E&P), developing and extracting oil and gas, with downstream assets, which are involved with refining oil and gas into consumable products and delivering them to end users. Specific midstream assets include, but are not limited to: gathering lines for wells, short- and long-haul pipelines; truck and barge transportation; hydrocarbon processing and compression stations; and storage facilities.

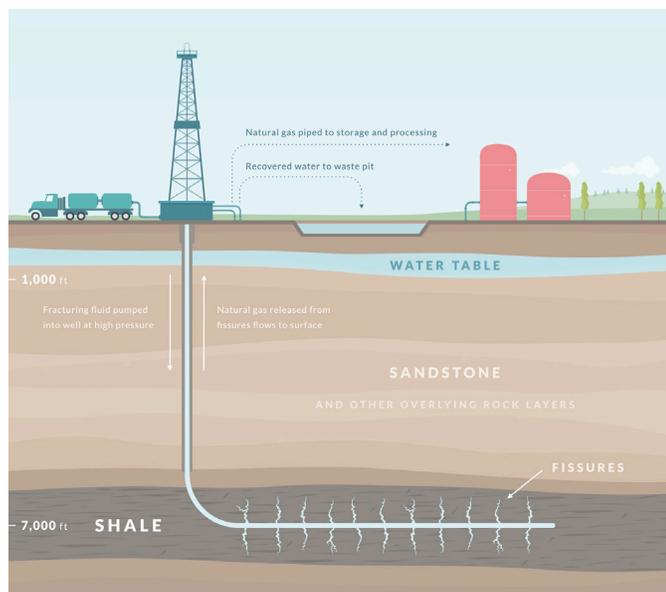


Midstream investing generally involves purchasing long-life assets, but it can also involve providing capital for repurposing or expanding existing assets. Further, greenfield development projects for processing facilities and pipelines are a growing area for investment, as the industry looks to keep pace with additional shale gas discoveries. Unconventional U.S. shale E&P, which utilizes horizontal drilling to extract oil and gas from shale rock, continues to increase its volume production. In

this arena, midstream assets have become the bottleneck to process and distribute the unprecedented supply. While unconventional E&P activity may occur in areas where there is existing production and infrastructure, often times new midstream assets must be constructed and developed to move hydrocarbons to market. The midstream sector is expected to continue to grow over the next few decades in order to meet the demand for U.S. shale production.

Demand drivers for midstream energy assets

Shale rock is considered the source rock where oil and natural gas formed over tens of millions of years, and the U.S. has an abundance of shale formations. Shale has been known to be the source rock, which is the rock from which hydrocarbons have been generated or are capable of being generated, for decades. However, the conventional extraction method for hydrocarbons was to drill into resource rock, such as sandstone, which are rock formations in which some hydrocarbons have migrated after forming in source rock. Shale rock was not considered porous enough to economically tap into the reserves trapped in this layer. Over the past two decades, several technological advances have revolutionized extraction methods. The first was hydraulic fracturing (i.e., “fracking”), which uses high pressure to inject a mixture of chemicals, sand, and water into the source rock that would crack the rock containing the oil and gas. Fracking allowed once unobtainable commodities to be economically extracted as long as the area had access to the water and sand necessary to perform the process.



The second technological advance came with the emergence of horizontal (or “directional”) drilling. The historical method was to drill a vertical (or “conventional”) well, which was a profitable method to extract in basins with large reserves that were accessible in formations with free flowing oil and gas in the resource rock. Horizontal drilling was a revolutionary process that involves drilling vertically until the desired

depth is reached and then turning to drill horizontally, enabling drillers to cover a significantly larger area within a hydrocarbon zone than a conventional well. As the technology and experience advanced with unconventional drilling, unconventional formations such as shale rock could be economically drilled as costs decreased and efficiencies improved. This has resulted in a continued increase in U.S. production, as shown in the projection below.

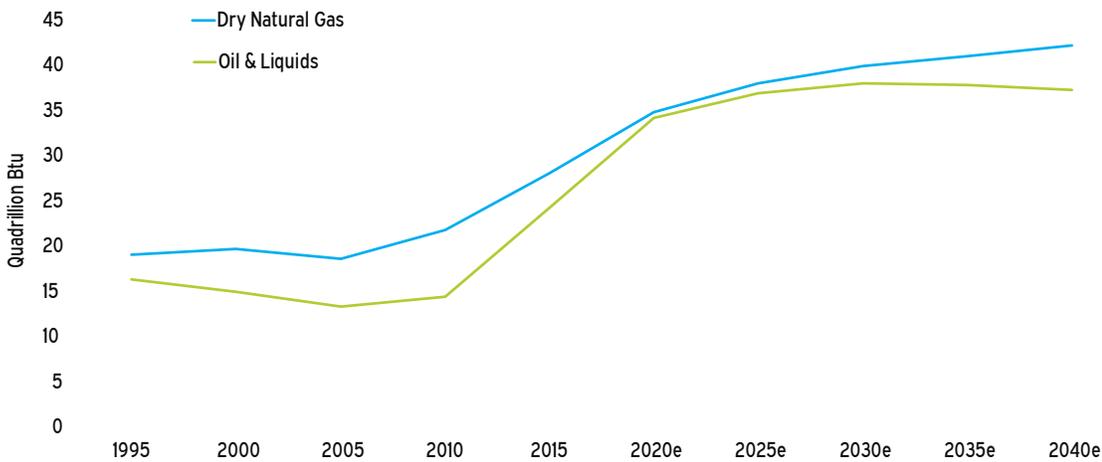


CHART 1
U.S. Oil and Gas
Production¹

¹ U.S. Energy Information Administration, Annual Energy Outlook 2019.

The U.S. has natural access to the required supplies for fracking, such as water and sand, as well as experienced operators, which is one reason shale has been almost exclusively exploited within the U.S. As technology continues to evolve, geographic focus areas continue to change and new formations become more economical to explore and develop. As seen in the chart above, shale gas production is expected to continue to grow, especially natural gas, for the next few decades and growth is only possible if the infrastructure is in place to handle the production.

For these reasons, there is a continued demand for additional midstream infrastructure to move and store the unprecedented volumes. Furthermore, in 2015, the U.S. removed an export restriction on U.S.-produced oil that had been in place since the mid-1970s. Lifting the ban helped support domestic oil and gas producers and relieved the excess supply within the U.S. As a result, international markets are increasingly becoming an important end market for U.S. hydrocarbons, and there is an increasing need to develop and debottleneck the midstream energy networks from the producing fields to the export terminals, typically located along the Gulf Coast.

Midstream subsectors

Midstream assets can be categorized in three main subsectors: gathering & processing, transportation, and storage & terminals. Each of these has a unique risk/return profile and generates its returns through both volume and rental revenue profiles. Some investments are structured with price-certain contracts (e.g., take-or-pay, volumetric commitments, offtakes), which may not move in conjunction with changes in the price of either the input or the output commodity. Other contracts can be established with indirect commodity exposure through long-term acreage dedications and joint ventures with commodity producers.

Gathering and processing

When hydrocarbons are extracted by E&P companies, the product's initial destination is gathering and processing facilities. "Gathering" oil and gas refers to a series of shorter pipelines that are designed to deliver hydrocarbons to processing facilities and eventually to transportation methods, primarily long haul pipelines. Processing facilities have several functions and end products:

- Separating oil and natural gas liquids ("NGLs") from the dry natural gas--The dry natural gas can then be processed to remove impurities in order to become pipeline quality natural gas.
- Separating water and other chemicals from hydrocarbons--As part of the fracking process described earlier, water and other chemicals need to be separated from the hydrocarbons. This process begins at the wellhead where heaters and scrubbers are used to remove sand and other particles to be recycled before sending the hydrocarbons to the processing facilities to remove water and remaining particles.
- Separating NGLs into their raw forms--The facility will perform NGL fractionation, which is the process of separating NGLs into their raw forms, which are sold separately as ethane, butane, propane, etc. The last function of the processing facilities is the removal of sulfur and carbon dioxide. The four processes are designed to create products with an acceptable quality level to be released to pipelines and other transport facilities.

Gathering and processing facilities typically have volume-based revenue models that will be dependent on the producers' output and their ability to maintain or grow production volumes. These types of midstream assets will have a higher correlation to commodity prices when servicing higher break-even cost operators. Traditional horizontal basins, with higher break even production prices and declining production curves, are more exposed to production curtailments in a low commodity price environment.

Transportation

The primary form of moving oil and gas from the wellhead to processors is through pipelines, although other transportation methods include tanker trucks, rail lines, or barge/tankers. The most efficient mode is typically pipelines that can be both short distance or long haul lines that can range thousands of miles across multiple states. A key to the continued upstream expansion is the ability to install pipelines that will connect new regions to gathering and processing facilities. The process of going from development to operations also requires advance planning, which is a reason midstream infrastructure has been struggling to catch up to drilling programs. The typical timeframe for a long haul pipeline is 3 years, with 1.5 years of planning and permitting, and 1.5 years of construction. Once constructed, the typical revenue structure for pipelines are volume-based payouts. Similar to gathering and processing facilities, pipelines serving low-cost producers are less exposed to commodity price movements as production volumes can remain consistent at lower price levels.

There are three principal types of underground facilities: depleted oil and/or natural gas fields, aquifers (rock formation that acts as natural water reservoirs), or salt cavern formations.

Storage and terminals

As the production volume of oil and gas continues to increase within the U.S., there is a growing need for storage facilities and terminals to deliver the hydrocarbons to the downstream market. Oil and liquefied natural gas (“LNG”) storage requires bulk container facilities that can hold the product for future needs. Unlike liquids, which are stored in above ground container units, natural gas must be stored under high pressure in underground storage reservoirs. There are three principal types of underground facilities: depleted oil and/or natural gas fields, aquifers (rock formation that acts as natural water reservoirs), or salt cavern formations. Natural gas storage is necessary to avoid flaring at oil rigs, which is a wasteful practice used to release pressure. Onsite underground storage and processing can lead to an additional revenue stream instead of burning away the product. The growth in storage facilities enhances the flexibility of the energy economy by allowing the steady supply of fuel for winter heating and summer gas consumption. As the U.S. continues to increase production of oil and gas out of shale rock, a growing focus has been on NGL terminals to transport natural gas to countries in Asia, South America, and Western Europe.

Unlike transportation and processing, the storage market is typically a rental-based revenue model. With this model, storage will have less correlation to commodity prices and more price certainty based on the rental agreements.

Master Limited Partnerships (“MLPs”) impact on private equity midstream investments

MLPs are an investment partnership managed by a General Partner (“GP”) on behalf of non control Limited Partner (“LP”) investors. They are typically, but not always, traded in the public markets. Investments held by MLPs cover all sub-sectors focused on transportation, processing, and storage. To be classified as an MLP, the partnership must exclusively invest in natural resources and minerals. An MLP does not pay federal income tax, and serves as a pass-through entity for its LPs. By avoiding the federal income tax, an MLP has more cash available to distribute to investors, hence making MLPs attractive to investors focused on yield. Relative to private equity, MLPs have a lower cost of capital and have historically represented a major source of competition.

Up until about 2014, an MLP would distribute *all* free cash flow and continually seek additional capital from the public markets in order to grow. However, after raising over \$25 billion in 2013, U.S. MLPs raised less than \$1 billion in 2018, following a steady decline in equity issuance. The Alerian MLP index, which tracks public MLPs, also declined from a high of over 530 in mid-2014 down to approximately 250 today. This dearth of equity capital required MLPs to retain cash flow in order to reinvest in additional assets. At the same time, MLPs began focusing on their core geographic expertise and stabilizing balance sheets and capital structures. This created a buying opportunity within the private markets, as MLPs looked to sell non-core assets. The distressed nature of the market due to lack of public funding and depressed public prices created a valuation disconnect and opportunity for private equity firms to either take an MLP private at attractive valuations or purchase non core assets from an MLP. Going forward, MLPs should remain large and active participants in the midstream market, serving as a source of both deal flow and liquidity for private market participants.

Ways to invest in the energy midstream sector

An institutional investor looking to add midstream energy to its portfolio has several options within both the public and private markets. Midstream MLP structures can be accessed through public purchase of LP units or through MLP portfolio managers that typically set up separate accounts to build diversified MLP portfolios for institutional investors. Note that the MLP market can be volatile from a valuation perspective, as discussed above. With volatility, however, comes opportunities to acquire positions at attractive prices.

For private market investors, several types of managers can provide exposure to the sector. Midstream energy investments can exhibit characteristics of both natural resources and infrastructure asset classes. Investors can gain exposure to midstream from either of both allocations. Historically, many large cap upstream energy investment managers have integrated midstream assets to capture more value within the energy value chain, while many sector-diversified infrastructure managers have invested in midstream assets, in particular those related to power generation. More recently, a growing number of exclusively midstream-focused managers have entered the market. In the early 2000s there were just two sector-focused midstream fund managers. As the sector matured and investment opportunities increased, more firms raised midstream-focused funds. Today, over ten firms actively manage private midstream strategies, with funds ranging from \$300 million to \$3 billion in capitalization.

Investment characteristics and role in an energy portfolio

Midstream investments can be characterized by their large capital expenditures and high yield potential. Within energy investing, midstream infrastructure will require a relatively large upfront expenditure. Once built and connected with upstream producers, steady income can be achieved that will be driven mostly by volume or occupancy and only indirectly by oil and gas prices. Low-cost producers will continue to extract resources at low commodity prices, though their profitability will contract. Since gathering systems and pipelines are typically on take-or-pay volume contracts, the yield will be more consistent in midstream investing in this type of commodity price environment. The table below provides a summary of the investment characteristics for the three sub-sectors.

	Gathering and Processing	Transportation	Storage and Terminals
Revenue Model	Volume Based	Volume Based	Rental Based
Commodity Linkage	Moderate	Moderate	Low
Capital Expenditure	High	Moderate	High
Yield	High	High	High

Private midstream provides an opportunity to invest in long-term contracted revenue streams with upside potential, given the growing demand for these assets. It is important for midstream investors to understand where the potential future needs are for additional midstream infrastructure and which basins will be producing going forward. Once a processing center, pipeline, or storage terminal is installed, the facility cannot be moved economically. Currently, midstream-focused funds are typically targeting 20% to 25% gross returns. The target returns from *upstream* funds range from mid-teens to 20%+ based on the level of exploration risk. The upstream returns

will be highly correlated to commodity prices, so the addition of midstream can lower the correlation to the overall energy sector. Midstream companies typically do not control production volumes, so there is risk with the level of capital expenditure that volume levels will be insufficient.

Summary

Midstream infrastructure is an area that will need continued focus and capital for the next few decades, and private markets will be a major source of capital and development expertise. It is expected that investments in midstream infrastructure will contribute \$1.3 trillion to gross domestic product in the U.S. and Canada through 2035. This includes capex of \$790 billion for new oil and gas infrastructure development.² Existing infrastructure requires additional funding to maintain efficiency and safety, and new infrastructure requires investment to support the growing expansion of shale plays. The bottleneck in the production process continues to be distribution and processing of the unprecedented supply of hydrocarbons that are now economically feasible to extract.

As an institutional investor, there are several opportunities to invest in this growing market, including via MLPs, diversified energy or infrastructure managers, or sector-specific midstream managers. The opportunity set includes both new construction and follow-on opportunities, which should be selected according to an investors' risk and return requirement. Including an allocation to midstream within a natural resource portfolio should provide valuable diversification, given the sector's lower sensitivity to commodity prices and upside potential from volume growth via U.S. shale production.

² The INGAA Foundation, North American Midstream Infrastructure through 2035.

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