The Role of Natural Gas Liquids (NGLs) in the American Petrochemical Boom

White Paper | November 2026



KINDER MORGAN

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The United States experienced unprecedented growth in natural gas production over the past two decades. Driven by technological advancements such as hydraulic fracturing and horizontal drilling, along with the development of prolific shale plays, domestic dry natural gas production more than doubled, from approximately 18.5 trillion cubic feet in 2006 to more than 39.2 trillion cubic feet in 2025.[1]

In recent years, many Americans have experienced the benefits that increased domestic oil and gas production provide consumers, such as lower costs for home heating, automobile gasoline, and electricity. Additionally, there has been a decrease in electricity-sector emissions thanks to natural gas-fired power plants, and reduced reliance on foreign countries for energy imports. It is less recognized, however, that this shale revolution in America also resulted in an "NGL revolution."

In addition to methane, natural gas contains hydrocarbons known as natural gas liquids (NGLs), like ethane, propane, butane, isobutane, and pentane. Natural gas processing plants and refineries remove (or condense) NGLs as a liquid from the vaporous natural gas stream.

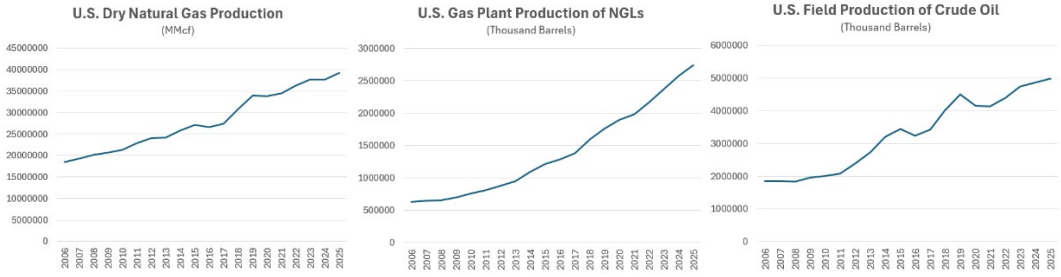


FIGURE 1: Comparison of U.S. natural gas, NGL production, and crude oil. (Source: EIA, 2026 Data)

Given the substantial growth in natural gas production, it's no surprise that NGL production in the United States boomed, increasing by more than 330% in 20 years from approximately 635 million barrels in 2006 to approximately 2.74 billion barrels in 2025.[2] The increased availability of domestic NGLs is a major boon to the U.S. petrochemical and manufacturing industries, as well as a benefit to U.S. consumers. See Figure 1 above for a comparison of the increases in U.S. domestic natural gas, crude oil, and NGL production over the past two decades.

[i] NOTE: EIA figures for NGL production do NOT include ethane rejected back into the gas stream.

NGLs play an underappreciated and essential role in our lives as feedstocks for thousands of consumer goods. For example, a pair of athletic shoes likely contains at least three different NGL-derived petrochemicals. The outsole and midsole of the shoe is likely made from durable polyurethane foam, a derivative of the petrochemical **propylene**.



The insole cushion that your foot rests on is made of ethylene vinyl acetate (EVA), a derivative of the petrochemical **ethylene**. The exterior top and sides of the shoe are often nylon, a derivative of the petrochemical **benzene**. [3,4] NGLs aren't limited to plastics and clothing -- they are a key ingredient in almost every aspect of our lives, including building materials, bicycles, plastic bottles, food packaging, shopping bags, car parts, heating fuels, carpeting, synthetic fabrics, medications, skis, snowboards, hiking boots, backpacks, and even baby diapers, to name a few. So, what are NGLs and where do they come from?

WHAT ARE NGLs?

Natural gas is a mixture of hydrocarbon gases, and the ratio of these different components varies. Typically, methane makes up 70-90% of natural gas.[5] The remaining 10-30% is made up of various NGLs, including ethane, propane, butane, and pentane, as well as small amounts of gases, including carbon dioxide, oxygen, and nitrogen.[6] While NGLs are gaseous at underground pressure, the molecules condense at atmospheric pressure and turn into liquids.[7] The composition of natural gas can vary by geographic region, the geological age of the deposit, the depth of the gas, and many other factors. Natural gas rich in NGLs and condensates is referred to as wet gas, while gas that is primarily methane, with little to no liquid content when extracted, is referred to as dry gas.[8]

When natural gas is extracted during production, it must be processed to separate the pure natural gas (methane) from various other hydrocarbons and fluids to produce what is known as pipeline-quality dry natural gas.

Once natural gas comes out of the wellhead, any oil and water present in the gas is removed, either at the wellhead or at a nearby processing facility. Once the gas is transported to one of these facilities, other non-NGL liquids, such as sulfur, helium, and carbon dioxide, are removed before the NGLs are extracted.[9] The process of separating the NGLs from the natural gas stream is complex. Once NGLs are separated from the natural gas stream, they must also be separated from one another.



FIGURE 2: A view of Kinder Morgan's Houston Central Plant, which processes NGLs.

The process of separating various NGLs is called **fractionation**. Because each molecule (ethane, propane, etc.) has a different boiling point, the hydrocarbon stream goes through multiple fractionators, each with a different temperature. This removes a different NGL at each step, starting with the lightest hydrocarbons and working up to the heaviest. Typically, ethane is removed first, followed by propane, butane, and isobutane.[10] After these NGLs are removed and the natural gas meets pipeline quality standards, it is sent to natural gas utilities, power generators, and industrial customers. See Figure 3 below for a flowchart of the process.

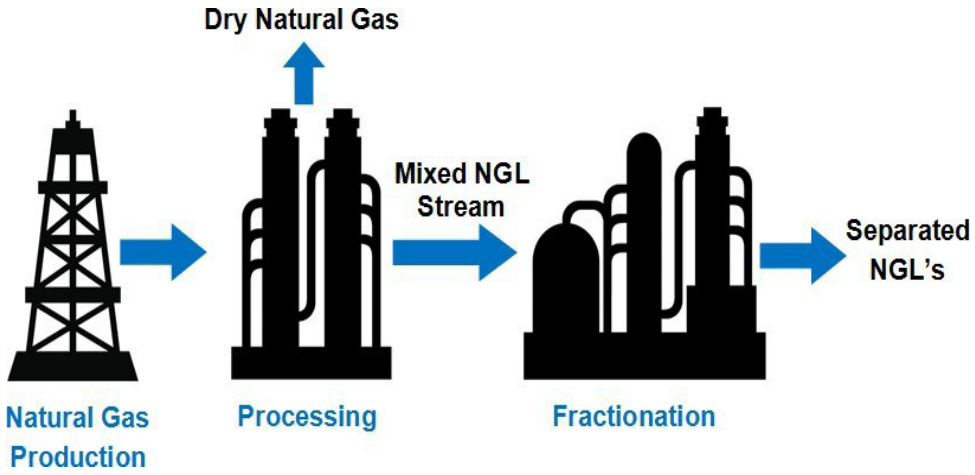


FIGURE 3: Natural gas processing steps.

WHAT ARE NGLs USED FOR?

Of the approximately 2.74 million barrels of U.S. NGLs produced in 2025, ~41% was ethane, ~31% propane, ~12% natural gasoline, ~10% normal butane, and ~6% isobutane.[11]

NGLs are used for a variety of purposes in almost all sectors of the U.S. economy. Ethane is used almost exclusively in the production of ethylene, which is then turned into plastics. Propane is mostly used for heating and as a petrochemical feedstock. Butane and isobutane are typically blended into petroleum products to create various fuels.[12]

The largest customer for NGLs, particularly ethane, is the chemical industry. Ethane is valuable because it is used to create ethylene, which is the raw ingredient in most types of plastics. The complex process of converting ethane into ethylene is called **cracking.** Ethane cracker facilities heat the gas to change the chemical composition of the ethane molecules, resulting predominantly in ethylene. The ethylene is then cooled rapidly so it can be transported via pipelines in its liquid state.[13] Other chemicals can then be added to create entirely new compounds that are made into many of the consumer products we use every day. See Figure 5 below for examples of products made from various forms of ethylene.

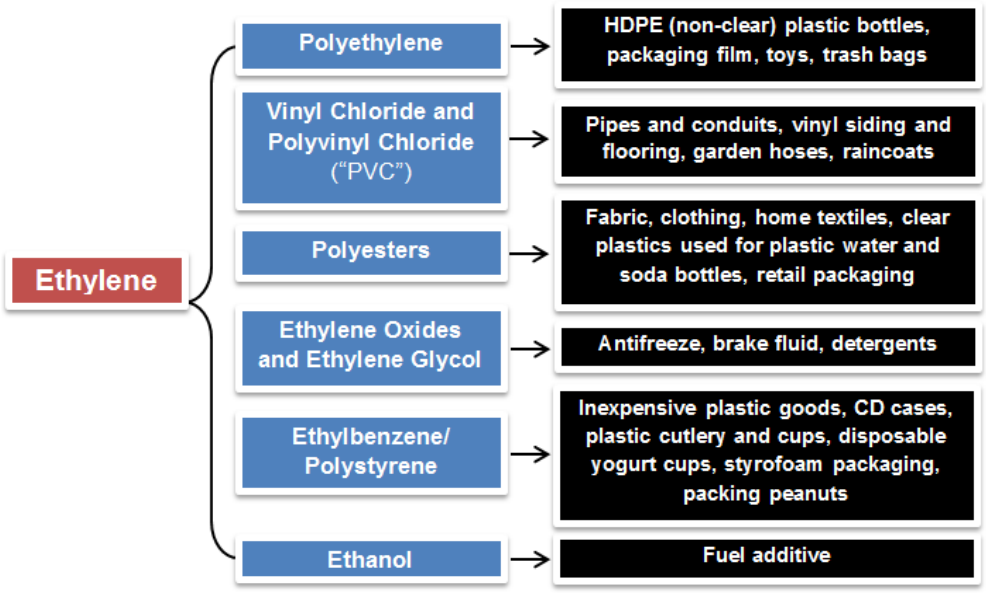


Figure 5: Products derived from ethylene and their uses.

In addition to ethylene, other chemicals derived from NGLs include propylene, benzene, methanol, and butadiene. Although we may not recognize their names immediately, these products are building blocks in consumer items and applications that most of us use daily.

- **Propylene and its derivatives** are often found in the form polypropylene, which is used for injection-molded plastics. This includes everything from bottles and other containers to appliance components and fibers, like carpeting. Propylene is a component in automobile parts, antifreeze, adhesives, and disposable diapers.[14]



- **Benzene and its derivatives** are combined with ethylene to make styrene and polystyrene plastics. Benzene is also used to create phenol, an ingredient in polycarbonates for pharmaceuticals, syringes, industrial coatings, and adhesives. Benzene is also used to produce cyclohexane, which is a precursor to nylon, one of the most common synthetic fabrics used in textiles, apparel, tents, and many other home products.[15]



- **Methanol and its derivatives** are used to make formaldehyde, plywood, insulation, and particleboard, as well as to make acetic acid for paints, adhesives, and acrylic signs.[16]



- **Butadiene and its derivatives** are used to make artificial rubbers for tires, hoses, conveyor belts, chewing gum, and shoes.[17]



HOW NGLs GROW THE ECONOMY

U.S. petrochemical manufacturers are now benefiting from an increased supply of low-cost NGLs. This gives these producers a large competitive advantage versus manufacturers in other countries that do not have an abundant supply of NGLs. In fact, feedstocks account for 60 to 70% of the total cost to manufacture

petrochemicals.[18] Even a small drop in the cost of these feedstocks is a major benefit to U.S. manufacturers.

The increased availability of low-cost energy and NGLs has encouraged U.S. petrochemical manufacturers to expand their businesses. The American Chemistry Council reported that chemical industry capital spending grew to $34.4 billion in 2025, with higher spending on equipment and structures. In 2027 and beyond, capital spending is expected to accelerate to 3-4% per year.[19]

CHALLENGES FOR CONTINUED DEVELOPMENT

As the United States continues to increase its supply of natural gas and NGLs, continued development of the infrastructure to move them and the facilities to process them are vital. A report produced for the Interstate Natural Gas Association of America found that generally, NGL production will grow as natural gas production increases. This is because much of the new natural gas production has a relatively high liquids content.[20] The main challenge that the NGL and petrochemical industries must address is transportation logistics from natural gas producing areas to fractionation facilities.

In 2025, approximately 58% of all U.S. NGLs were fractionated in Texas and Louisiana.[21] Yet that same year, Texas and Louisiana combined accounted for only about 38% of U.S. natural gas production.[22] This means that in order for fractionation facilities to continue operating at full capacity, NGLs must be shipped to them. However, according to the U.S. Energy Information Administration, shipping NGLs is difficult, as they “are expensive to handle, store and transport compared to refined products.” This is because they “require high pressure and/or low temperature to maintain liquid state for shipping and handling.”[23] The U.S. has built several large NGL pipelines in recent years, but the length of time associated with siting, permitting, and constructing a pipeline makes it challenging for pipeline companies to keep transportation capacity on pace with production.

In fact, the U.S. currently produces more NGLs than it is able to transport. [24] If takeaway capacity or markets are not available, the ethane is rejected, either by leaving a small amount of it in the natural gas stream (within federal and pipeline operator guidelines) or by flaring – intentionally burning it off. This is wasted product that could be very valuable if facilities were available to move and process it.

Although many companies are constructing or proposing new cracking facilities to process NGLs, they too have been unable to keep up with the boom in production.

Ethylene production plants, or ethane crackers, are expensive facilities that take several years to develop. A Shell cracking facility in Pennsylvania, which spent approximately 10 years in development, is estimated to have cost nearly $6 billion.[25] Another facility, completed in 2020 by Sasol in Lake Charles, Louisiana, cost almost $13 billion.[26]

In many cases, constructing a new cracker near a shale-gas producing area is far more expensive than constructing an NGL pipeline to service an existing cracking facility located farther away. As a result, more transportation capacity is needed to transport NGLs from the shale regions to existing and planned fractionation facilities. NOVA Chemicals chose to expand its cracker and build a new polyethylene reactor at their Corunna, Ontario facility due to its proximity to the Marcellus-Utica basin and the abundance of ethane being produced in that region. This expansion precipitated the need for the construction of Kinder Morgan's Utopia pipeline, which began service in 2018.

AN UPSIDE OF SURPLUS

Since the United States is unable to consume all of the NGLs it produces, more NGLs are available for export, which helps to reduce our trade deficit. Industry first started shipping NGLs by pipeline to Canada and developed facilities to ship NGLs by tanker overseas. American shipping of propane and butane grew from 0.33 million barrels per day in 2013 to approximately 2.32 million barrels per day in 2025, including about 1.78 million barrels per day of propane and 0.54 million barrels per day of normal butane.[27] Since the United States is not able to crack and process all of the ethane it produces domestically, we also began shipping ethane abroad in 2014. Ethane shipments increased from zero in 2013 to approximately 369,000 barrels per day in 2021.[28]

CONCLUSION

There are many immediate benefits of increased U.S. domestic natural gas production: lower costs for home heating and electricity, reduced emissions from power generation plants as they switch from coal and oil to natural gas, and a decreased reliance on foreign countries for energy. However, the secondary benefits of the domestic gas boom are also incredibly important to the U.S. economy. Increased domestic natural gas, oil, and NGL production is strengthening the refining and petrochemical industry, restoring the manufacturing sector, and making America a global energy superpower. Kinder Morgan intends to play a part in enabling this success story by moving these products safely and efficiently from production to economic use.

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