

Eagle Ford Impacting Liquids Market

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and Susan L. Starr

ADDISON, TX.—The productivity of the Eagle Ford Shale has been unlocked over the past three years with the application of improved horizontal drilling and hydraulic fracturing techniques first honed by producers developing the Barnett Shale to the northeast.

Since the Eagle Ford discovery well was drilled by Petrohawk in 2008 in the Hawkville Field in La Salle County, Tx., production has soared as drilling and development activity has transitioned from first the dry gas window to the liquids-rich gas and now crude oil windows. Producers such as Anadarko Petroleum, Apache Corp., Cabot Oil & Gas, Chesapeake Energy, EOG Resources, Marathon, Newfield Exploration and Pioneer Natural Resources

are among the play's leading operators, and are driving the rapidly expanding production volumes.

Figure 1 provides an overview of the geographic extent of the Eagle Ford play. Liquid production varies widely, with wells on the southeastern flank producing dry gas, wells on the "interior" of the play producing wet gas and condensate, and wells to the northwest producing oil. Liquid production is mostly light sweet crude oil and condensate, with condensate making up approximately 50 percent of the produced volume. Condensate quality varies significantly throughout the play, with API gravities ranging from 45 to 60 degrees.

The rapid pace of reserve development in the Eagle Ford is challenging producers, midstream service providers and downstream customers alike to provide adequate infrastructure to timely monetize the

play's prolific reserves.

As shown in Figure 2, the growth in Eagle Ford production has been phenomenal, with the average crude and condensate rate increasing from a mere 600 barrels a day in 2008 to more than 120,000 bbl/d in 2011. Companies are dedicating significant resources to the region and production rates are expected to continue to increase through at least 2020.

Figure 3 provides a summary of historical and expected future crude and condensate production rates. Industry forecasts indicate that producers expect the total crude and condensate production rate to reach between 500,000 and 800,000 bbl/d by 2020, with approximately 50 percent of the liquids volume attributable to condensate production. Eagle Ford crude and condensate is being delivered to local and regional refiners, displacing foreign light crude imports. With Texas imports of light crude averaging 800,000 bbl/d from 2008 to 2011, the anticipated increase in Eagle Ford output over time will easily be accommodated by regional demand.

Natural gas liquids production from the Eagle Ford is expected to grow along a trend similar to crude oil, with production ramping up from essentially zero in 2008 to between 300,000 and 400,000 bbl/d by 2020. In contrast to the regional crude supply balance, Texas NGL supply and demand has been fairly balanced over the past few years. Texas imports of foreign, waterborne NGLs from 2009 to 2011 have been negligible, making the longer-term disposition of NGLs more complex.

Gulf Coast Oil Markets

As shown in Figure 1, refineries are located within or adjacent to the Eagle Ford play, or very nearby in the South

FIGURE 1

Regional Map of Eagle Ford Shale Play

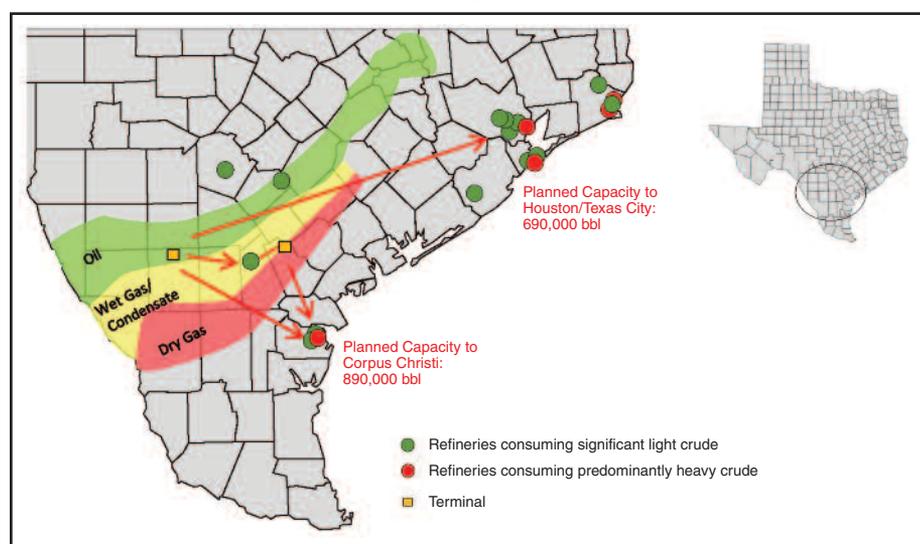
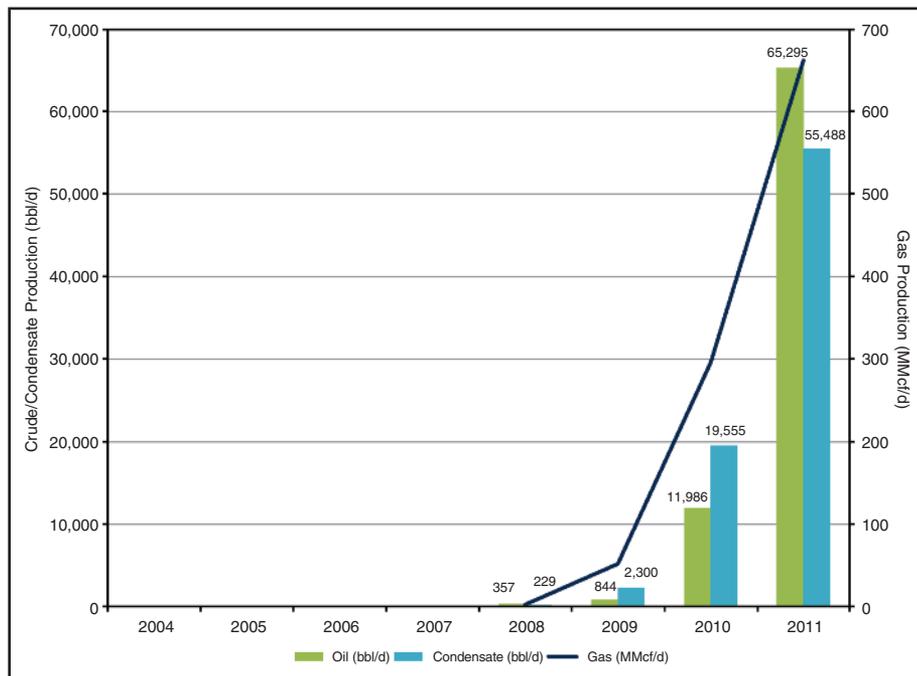




FIGURE 2
Historical Eagle Ford Production

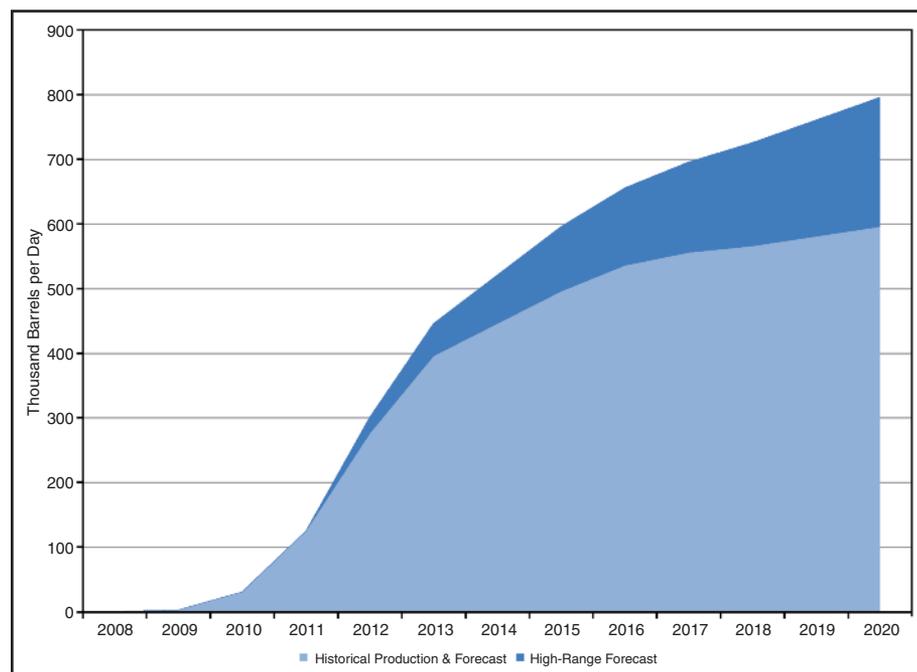


Source: Railroad Commission of Texas

Texas region and along the Texas Gulf Coast. Today, U.S. Gulf Coast refiners process a mix of locally produced, offshore Gulf of Mexico, and foreign crudes, with each refinery typically running a blend of light, medium, and heavy crude grades.

Refineries also operate within the Eagle Ford play area at Three Rivers and San Antonio. In addition, an idled refinery at Nixon, Tx., is scheduled to restart in 2012, resulting in 125,000 bbl/d of available local crude refining capacity.

FIGURE 3
Actual and Forecast Eagle Ford Crude Oil and Condensate Production



Three refineries operate at Corpus Christi and provide an additional 640,000 bbl/d of regional capacity. Several integrated refineries process crude and condensate farther up the Texas Gulf Coast, with 2.4 million bbl/d of capacity in the Texas City/Houston area and another 1.1 million bbl/d of capacity in the Beaumont/Port Arthur area. Farther to the east but accessible by water are refining centers located at Lake Charles, La., and along the Lower Mississippi River in Louisiana.

The long-term outlook for U.S. Gulf Coast refinery crude runs is flat to declining, in step with forecasted U.S. refined product demand. Some near-term increases in crude inputs are expected to offset refinery closures in the Northeast and the Caribbean. Other than the Motiva refinery expansion in Port Arthur, Tx., (adding 275,000 capacity bbl/d in 2013, refining primarily foreign crude), no further refinery expansions are anticipated on the U.S. Gulf Coast.

Planned Eagle Ford crude and condensate infrastructure will transport produced volumes primarily to Corpus Christi and Houston. Significant pipeline, terminal and some limited rail capacity is under development and much of the announced capacity is backed by producer commitments. Marine terminal capacity is being developed in Corpus Christi, Houston and Texas City to facilitate Eagle Ford crude and condensate deliveries to other U.S. Gulf Coast refining centers and petrochemical producers.

Eagle Ford liquids also may have access to refiners located farther to the east, with pipeline projects being promoted to originate eastbound shipments out of the Houston/Port Arthur area. Based on current Eagle Ford production forecasts, planned regional infrastructure development appears to exceed requirements.

Displacing Foreign Imports

Gulf Coast crude oil demand is met today by a combination of domestic production and foreign crude/condensate imports. The impact of the dramatic increase in production from the Eagle Ford is being felt already in local refineries, and to a lesser extent, by other U.S. Gulf Coast refiners. Eagle Ford crude/condensate production averaged 130,000 bbl/d in 2011, while imports of light crude oil into Texas declined by just under 300,000 bbl/d from 2010 to 2011.

In the Corpus Christi area (including Three Rivers), imports of light crude oil



fell by 117,000 bbl/d during 2011, reflecting the availability of locally produced Eagle Ford volumes. In the future, Eagle Ford crude and condensate volumes will be distributed more widely and will compete with light crude imports to the Houston/Texas City area. Houston/Texas City refineries imported 325,000 bbl/d of light crude on average in 2011.

Medium and heavy crude imports are not expected to be impacted significantly by increases in Eagle Ford production. Medium crude imports to Texas in 2011 averaged 715,000 bbl/d. Future imports of medium crude are less likely to be displaced by Eagle Ford production without significant price downgrades for Eagle Ford producers. In the Houston/Texas City area, a large portion of the refining capacity is dedicated to upgrading lower-valued, heavy crude streams that the lighter Eagle Ford production will not displace.

Although most Gulf Coast refiners and petrochemical producers will be able to process Eagle Ford condensate production, the total volume of condensate processed by any one facility will be limited by a number of factors that are expected to impact the offered market price. Some refiners will have physical "light ends" capacity limitations, and will be unable to run significant volumes of

condensate because of the higher volume of light naphtha produced.

Conversely, condensate streams produce little to no heavy volume fractions (or "bottoms") to feed expensive coker units that operate in many Gulf Coast refineries to upgrade lower-value, heavy feedstock to higher-valued products. The naphtha content also will be limiting as a result of the overall decline in U.S. gasoline demand attributable to the nation's economic downturn. Naphtha also is utilized as feedstock in the petrochemical sector, but has been economically disadvantaged relative to lighter feedstock alternatives since 2008.

Such limitations on condensate demand provide economic incentives for projects such as Kinder Morgan's recently announced condensate splitter project with planned capacity of 25,000 bbl/d and possible expansion to 100,000 bbl/d. Condensate will be separated into naphtha, distillate and gas oil streams for sale into specific, higher-valued markets in the refining and petrochemicals sectors. From 2008 through October 2011, approximately 230,000 bbl/d of naphtha and gas oil was imported to meet refinery and ethylene feedstock demand in Texas. In the future, components fractionated out of Eagle Ford condensate streams will compete

with foreign imports to meet market demand.

Eagle Ford condensate or naphtha derived from the condensate also may be supplied as diluent utilized in transporting heavy Canadian crude to U.S. markets. Announced infrastructure and pipeline projects being considered to link Houston/Port Arthur markets to the St. James, La., area would enable efficient transport of Eagle Ford production to meet diluent demand.

Gulf Coast NGLs Market

Many world-scale petrochemical manufacturing facilities that consume light naphtha and NGLs as primary feedstock are located along the U.S. Gulf Coast. Figure 4 provides a summary of the gas processing plants, fractionation facilities and petrochemical plants located near the Eagle Ford play and along the Texas Gulf Coast. The numerous gas processing plants located in the region, in West Texas and as far north as the Rocky Mountains recover mixed streams of NGLs that are shipped to fractionation centers for separation into purity products such as propane, butane and natural gasoline.

Planned infrastructure projects terminating on the U.S. Gulf Coast also will expand the regional availability of NGLs produced in other areas, including the Bakken Shale in North Dakota as well as the Marcellus and other shale plays under development.

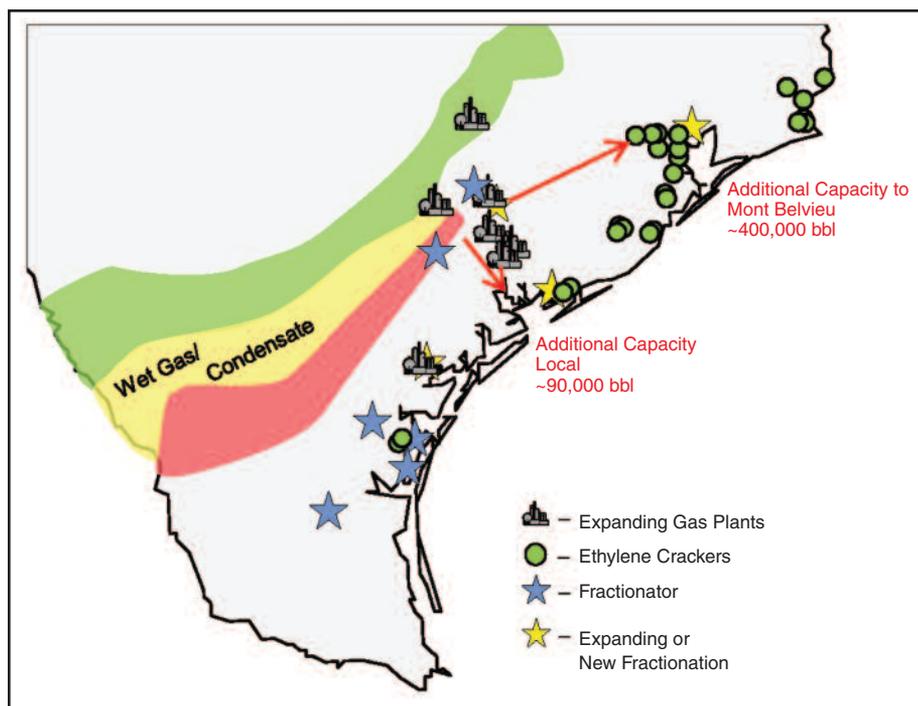
Ethylene is manufactured from NGL, naphtha, and gas oil. In most cases, petrochemical producers with capabilities to switch from gas oil and naphtha to lighter feedstock such as ethane have done so, and projects have been completed to convert heavy feedstock capacity to process lighter, NGL-derived feedstock.

Several additional "feedstock flexibility" projects also are under way. In Texas, NGL supply has been sufficient to meet the changing demand from ethylene producers. In the past four years, Texas imports of waterborne purity products (propane, butane and pentanes plus) from foreign sources have decreased from approximately 45,000 bbl/d in 2008 to about 2,000 bbl/d in 2009 and 2010. Through October 2011, none of these products were imported to Texas, while exports of propane and butane totaled 120,000 bbl/d.

The increased availability of domestically produced NGL has sparked a resurgence in the U.S. petrochemical industry.

FIGURE 4

Gulf Coast Petrochemical Manufacturing, Gas Processing Plants and NGL Fractionation Facilities





In 2010, Eastman restarted idled ethylene production capacity in Longview, Tx., and Dow is expected to restart capacity in Hahnville, La., this year. Numerous ethylene expansion projects have been announced, totaling more than 2,800 million pounds a year of additional capacity (Westlake, Williams, and Formosa) that is expected to start up on the U.S. Gulf Coast between 2012 and 2015.

Chevron, Phillips and Dow have announced new grass-roots U.S. Gulf Coast facilities totaling more than 7.5 billion pounds to be completed by 2017, and Sasol is considering the construction of a world-scale cracker to be located near Lake Charles in Louisiana. Outside of the region, grass-roots projects have been announced to take advantage of new supplies of NGLs produced in rich gas regions such as the Marcellus Shale. Much of the new capacity is focused on ethane as the primary feedstock, resulting in a likely overhang in the supply of propane and heavier NGL components.

New Infrastructure Required

Significant pipeline, processing and fractionation infrastructure will be required to meet the needs of Eagle Ford producers in the future. Existing gas transportation infrastructure in South Texas is being utilized and additions are being made to ensure adequate gas gathering and transportation capacity will be available to support gas processing operations. In some cases, dry gas transportation systems have been converted to wet gas service and are being repurposed to meet gas gathering needs.

Increased NGL production will come from new or expanded gas processing capacity. Announced projects are expected to add 1.7 billion cubic feet a day of new capacity for Eagle Ford producers in 2012 and another 2.0 Bcf/d in 2013 (Copano, Enterprise, Southcross, DCP, Boardwalk and ETP). The development of raw mix NGL pipeline capacity also is under way to provide processors with ready outlets for recovered liquids.

Two new long-haul pipelines (DCP, Lone Star/ETP) are being developed to transport NGLs from plants in the Permian Basin and the Eagle Ford to fractionators at Mont Belvieu, Tx. Pipeline capacity also is being developed to transport raw mix from Eagle Ford-dedicated processing plants to local fractionators. Some of the new pipeline capacity will connect with existing NGL pipeline infrastructure supplying facilities in the Mont Belvieu area

and petrochemical facilities along the U.S. Gulf Coast (ETP/Copano and Enterprise). Pipeline additions and expansions are expected to provide Eagle Ford processors with 90,000 bbl/d of capacity to supply local fractionators and approximately 400,000 bbl/d of transportation capacity to Mont Belvieu.

New fractionation capacity is needed with the increase in the supply of NGL raw mix. New facilities are being constructed to process the increasing NGL volumes from the Eagle Ford and other rich gas plays in West Texas, North Texas, Oklahoma and the Rockies. A total of 72,000 bbl/d of local fractionation capacity will be added by 2013 to serve Eagle Ford producers (Copano, Southcross and Formosa).

Regionally, operators in Mont Belvieu have announced projects totaling 380,000 bbl/d to be operational by year's end 2013 (Enterprise, Gulf Coast Fractionators, Cedar Bayou, Mont Belvieu and Lone Star NGL). Capacity expansions at Mont Belvieu serve not only Eagle Ford producers, but will process raw mix NGL supplied from other regions as well.

Regional infrastructure projects also will be required to facilitate transportation and delivery of purity projects to end-use customers and petrochemical manufacturers along the Gulf Coast and in other markets. Because of the large growth in expected NGL production from the Eagle Ford and other shale plays throughout the country, several liquefied petroleum gas export terminals have been announced. Additional propane and butane export capacity of 110,000 bbl/d is expected to be operational by 2013 with the development of another 150,000 bbl/d under consideration.

The rapid expansion of production from the Eagle Ford area has sparked significant support for developing regional infrastructure to gather, treat, process and transport produced oil, condensate and natural gas. Liquids produced from the Eagle Ford play will impact market supply and demand balances in South Texas, along the Gulf Coast and the Lower Mississippi River. Ultimately, the disposition of these liquids depends on the quality relative to competing supplies, production rates over time, infrastructure availability, and demand from refiners and petrochemical producers along the Gulf Coast and in other economically accessible markets. □



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