



DECISION BRIEF

North Atlantic Heating Oil Markets—Will Inventories Build in Time for Winter?

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North Atlantic Heating Oil Markets— Will Inventories Build in Time for Winter?*

The end of the summer gasoline demand season is fast approaching, and North Atlantic refined products markets have shifted their focus to the coming winter. Public scrutiny of products markets, and of prospects for the distillate market this winter in particular, has increased because of low distillate stocks in the United States and Europe. In CERA's view, the outlook for North Atlantic heating oil markets is dependent on two key factors:

- **Tight global markets—backwardation discourages inventory building.** Tight global crude oil markets are causing persistent backwardation in crude oil and distillate futures markets, and as a result there is a disincentive for inventories to build. The longer the crude oil market stays in backwardation, the greater the likelihood that capacity limits in the refining and distribution system will constrain the rebuilding of stocks to comfortable levels.
- **Refining and product logistics capacity—adequate but tight.** Refining and logistics systems have sufficient capability to rebuild inventories to acceptable levels between now and the end of November, when the period of highest average heating demand starts. However the balance is tight, and utilization of refineries and logistics systems will have to be high through the autumn for stocks to build to comfortable levels.

Concern is growing about the ability of refining and logistics systems in North Atlantic markets to deliver adequate inventories for the start of the heating season. Failure to build stocks would increase the risk of a repeat of the sharp spikes of US Northeast heating oil prices of January and February 2000, and of US retail gasoline prices this past summer. This concern is manifested in the recent sharp strengthening in prompt distillate-to-crude price differentials in spot refining markets on both sides of the North Atlantic.

CERA's analysis indicates that refineries, pipelines, and tanker fleets supplying the European and North American markets have the capability to rebuild inventories to adequate levels by November 30, 2000, but there is limited slack in the system, and rapid stock building will have to start soon. If the market disincentive to build stocks persists much longer, capacity constraints in refining and distribution will become an increasingly important issue.

The physical capability to produce and transport adequate distillate volumes is by itself not sufficient for inventories to rebuild; refiners, shippers, and wholesalers must also have the right market incentives. In CERA's view the likelihood is growing that the tight crude oil market and continuing crude oil futures backwardation could influence refined product market conditions such that this physical capability to produce and transport distillate inventories will not be fully utilized in the coming months. As a consequence, the risk is growing that distillate markets in North America and/or Europe will face periods of tight supply and high prices during the upcoming heating season, with refining and logistics systems continually playing catch-up with demand.

Even if primary stock levels in North America and Europe do build to adequate levels by the end of November, further factors could result in a tightly balanced distillate market in the winter of 2000/01:

- **Tight North American natural gas markets.** The North American natural gas market is very tightly balanced and prices are high. Relatively low cooling demand in the US Northeast and Midwest for much of the summer has resulted in some recovery in storage levels, but CERA's outlook continues for a tight supply-demand balance and high prices through the winter. CERA expects that this could lead to peak winter demand for distillates being heightened as natural gas customers increasingly shift to distillate as a back-up fuel.

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- **Low wholesale and consumer stocks could be a concern.** There are indications that secondary and tertiary stock levels are currently below typical levels, and lower than last year:
 - German household stocks of heating oil are estimated to be at 55 to 60 percent of capacity, well below the 70–75 percent that is typical at the end of the third quarter.
 - Persistent backwardation in futures markets has likely also resulted in low inventories at the wholesale level on both sides of the Atlantic. There are, however, some indications that secondary stocks may be building out of concern over future supply, rising prompt prices, and the coming harvest season. Demand associated with such stockbuilding would reduce future demand.

The Origin of Today's Low Heating Fuel Inventories—OPEC Production Restraint

Primary inventories of jet fuel plus distillates in the North Atlantic are at unusually low levels:

- **US primary stocks are low.** Total US primary jet fuel plus distillate stocks are nearly 30 million barrels lower than a year ago, with almost all of the shortfall concentrated in East Coast (PADD I) heating oil inventories. Heating oil stocks in PADD I haven't been this low since 1996.
- **Low European primary stocks.** At the end of July, primary jet/kerosene plus distillate stocks in Europe were some 55 million barrels below the very high levels of last year and only 15 million barrels above the very low levels of end-July 1996.

The origins of these low stock levels lie in OPEC's response to the collapse in crude oil prices that occurred in 1998. Working in concert with non-OPEC Mexico, OPEC members agreed to a series of progressive reductions in output in 1998 and 1999. When combined with the resumption in demand growth in Asia in the wake of the 1997/98 crisis and the slowing in non-OPEC supply growth as a consequence of lower prices, OPEC's actions led to a steady squeezing out of excess crude oil inventories starting in 1998 and continuing in 1999 and into 2000.* Hence, crude oil prices recovered strongly over the course of 1999 and into 2000, and futures markets shifted decisively from contango (prompt prices lower than future prices) to backwardation (prompt prices higher than future prices).

Refined products futures markets also shifted from contango to backwardation in response to developments in the crude futures markets, and stock levels of refined products have fallen markedly from the very high levels of late 1998.** In a backwardated market, refiners, terminal operators, wholesalers, and consumers all face a strong disincentive to build stocks, since product produced or purchased on the basis of prompt prices and then held in inventory faces the risk of a decline in value, according to the futures market. This situation has been one of the dominant influences on the summer 2000 gasoline market, contributing to unusually strong gasoline margins and high prices.***

*See the CERA Summer 1999 and Winter 2000 *World Oil Watch*.

**See the CERA Winter 2000 *Refined Products Watch*.

***See the June 2, 2000 Refined Products *CERA Alert*.

The Components of Light Heating Fuel

CERA's analysis of heating fuel availability for the coming winter heating season considers jet fuel, kerosene, diesel fuel, and heating oil together. These products are produced from roughly the same part of the crude oil barrel, and hence increasing production of one product results to a significant degree in an offsetting reduction in the others. Further, there is some interchangeability of some of these products once into the logistics system—for example, jet fuel and diesel fuel can be used as blend stocks to increase the availability of heating oil (although not the other way around).

Capability versus Incentive—The Outlook for Crude Oil Prices and Futures Markets

CERA's analysis indicates that refining and logistics systems have the capability to rebuild inventories to adequate levels by the end of November, but this by no means assures that restocking will take place. Refiners, terminal operators, wholesalers, and consumers operate in a market environment and respond to market-based incentives. As highlighted above, persistent backwardation in crude oil and product futures markets is largely behind the current tight inventory situation, and unless this changes, market participants will not have the incentive to rebuild inventories.

The Crude Oil Market

The price and supply of crude oil will be highly dependent on OPEC's recent actions to raise production and the timing of the arrival of that oil in the major markets and on future OPEC production decisions. The longer it takes for crude oil inventories to begin to rise in consuming countries, the higher the prompt oil price will stay relative to the future price because of the belief that supplies will be more abundant and prices lower in the future. The longer this process takes, the longer it will be before refiners in consuming countries have the incentive to build the stocks necessary to meet expected peak winter demand. The higher the prompt price of oil relative to the future price of oil, e.g., the tighter the crude oil supply, the lower the incentive to build stocks.

CERA's view is for oil prices to decline from their current levels of over \$30 per barrel for WTI and average \$28 per barrel in the fourth quarter. This assumes typical seasonal weather patterns.* These prices should be sufficient to create a price environment that increases the incentive to build and hold heating oil stocks. However, the longer it takes for lower crude oil prices to develop, the lower stocks are likely to be at the beginning of the heating season.

Jet/kerosene and Distillate Markets

The major heating oil demand area in the United States (PADD I) is geographically removed from its largest source of supply (PADD III), and suppliers need to be able to cover future price risks in order to move and store products near the major markets. Currently this incentive does not exist because of the backwardation in the market. A similar situation obtains in European markets. Logistical supply lines for product transfers are not as long, and regional markets tend to be more self-sufficient than PADD I, but the key German heating oil market does depend on external sources of supply to meet a significant share of total demand. Terminal operators and wholesalers in Germany are unlikely to rebuild inventories fully in the face of continued backwardation.

Spot distillate-to-crude price differentials have strengthened significantly in recent weeks on both sides of the North Atlantic, and it appears that refiners are responding by increasing output. However, this by itself is not likely to result in the necessary transfers from PADD III to PADD I or up the Rhine into Germany that are needed for a strong inventory build to take place in the key heating oil demand centers. As long as distillate futures markets remain backwardated, the rate of stockbuild in key consuming markets is likely to remain below that needed to reach comfortable levels. The longer the crude oil market remains backwardated, the longer the distillate market is also likely to be backwardated. If this continues, the higher output of jet/kerosene and distillate that PADD III or Rotterdam refiners produce in response to strengthening prompt margins may simply build up in these supply centers, consequentially resulting in a weakening in prompt margins and an easing off in production rates.

*See the CERA Summer 2000 *World Oil Watch*.

Inventories in the United States—The System Has the Capacity to Respond

The current 30 million barrel deficit in jet fuel plus distillate inventories relative to the typical level of recent years is concentrated in PADD I heating oil inventories. Product stock levels in other regions are at typical seasonal levels. Hence the key question facing the US distillate market is whether PADD I heating oil inventories can build to typical seasonal levels while maintaining adequate jet fuel plus distillate inventories in the rest of the country. CERA's analysis indicates that sufficient capacity exists in the refining and logistics system to achieve this, given the appropriate market signals. Refinery production of distillate and jet fuel within PADD I makes up less than 30 percent of demand within the region. The majority of supply comes from interregional transfers from PADD III, with a much lesser contribution from product imports. Hence both distillates production and transfer capabilities are key elements to be considered in assessing the potential to rebuild inventories in PADD I in the coming months.

Production and Imports

CERA estimates that US refiners have the capability to produce an average of 3.75 million barrels per day (mbd) and 1.64 mbd of distillate and jet fuel, respectively, between now and the end of November. This is based on 1996–99 average US refinery utilization rates and product yields for the August-to-November period and on current refinery distillation capacity as reported by the Energy Information Administration (EIA). Using the same methodology, production capability of distillate and jet fuel in PADD I for the same time period are estimated at 0.47 and 0.11 mbd, respectively.

Most of the jet fuel and distillate imports into the United States are received in PADD I, and most of these imports come from Canada, Venezuela, and the Virgin Islands—with virtually no distillate or jet fuel imports coming from Europe during the winter. Based on recent historical averages, CERA estimates that imports for August–November averaging 0.37 mbd to the United States in total, of which 0.28 mbd enter in PADD I, are feasible. The expansion of the Irving Oil refinery in Saint John, New Brunswick, which was partially started up earlier this year and is scheduled for completion in the fourth quarter, could result in increased availability of imports beyond these levels.

Based on these production and import levels and CERA's outlook for US jet fuel and distillate demand, averaging 5.24 mbd from August through November, total US jet fuel plus distillate inventories would reach 190 million barrels at the end of November. This would be slightly above last year's level at that time and well above the 1996 level of 162 million barrels.

Transfers

CERA has estimated the capability to transfer jet/kerosene plus distillate from PADD III to PADD I based on historical transfer levels by pipeline, tanker, and barge (the principal modes used for interregional flows). The volumes of jet fuel plus distillate moved via pipeline from PADD III to PADD I reached peaks near 1.1 mbd several times during 1996 and 1997 and averaged about 0.95 mbd during those years. On this basis, CERA estimates that pipeline transfers of jet fuel plus distillate can reach 1.1 mbd during the peak distillate demand season.

Waterborne movements between US regions are restricted by law to Jones Act tankers or barges.* Waterborne shipments of jet fuel plus distillate from PADD III to PADD I exceeded 300 mbd several times during the winters of 1996/97 and 1997/98. However, CERA's analysis indicates that the capacity of Jones Act product tankers has decreased by 18 percent since 1996. CERA has estimated the current maximum capacity of waterborne distillate movements from PADD III to PADD I at 245,000 barrels per day (bd), based on the assumption that the capacity for waterborne movements of distillate by Jones Act tankers has been decreased in proportion to the decline in the Jones Act product tanker fleet.

*The Jones Act of 1920 required that all vessels carrying cargo between two US ports must be built in the US, crewed by US mariners, and owned by US citizens.

Stocks

Based on these capacity estimates, CERA has projected a feasible rate of PADD III to PADD I transfers during the August-to-November period, assuming a gradual increase in transfer rates toward these maximum achievable levels. Transfer rates approach the high end of their respective historical ranges, but these flows are assumed to be seasonal highs and are not assumed to be sustained over an extended period. On the basis of these transfer rates, production rates as described above, and CERA's current outlook for jet/kerosene plus distillate demand, total distillate plus jet fuel stocks in PADD I would reach nearly 75 million barrels by the end of November, exceeding the level of 73.2 million barrels reached at the end of November 1999 and well above the 55.2 million barrel level at the end of November 1996.

The details of this analysis for the total United States and for PADD I are provided in Table 1. The resulting potential build in primary stock levels for the United States and PADD I are compared to recent historical levels in Figures 1 and 2.

Table 1

CERA Estimates of Potential US and PADD I Distillate plus Jet Fuel Stockbuild*

(thousand barrels per day)

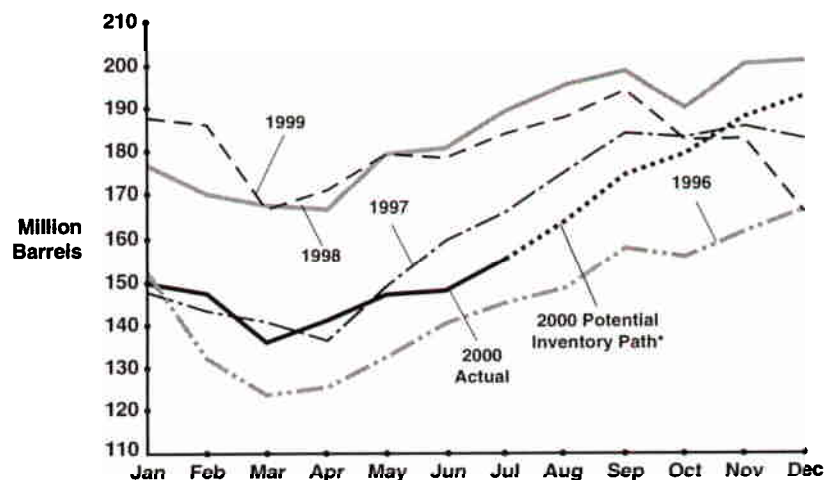
Total United States						
	<u>July (actual)</u>	<u>August</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Distillate + Jet Fuel						
Production	5,209	5,256	5,280	5,353	5,418	5,464
Imports	301	417	407	397	423	443
Exports	201	130	180	210	210	250
Stock Withdrawals (+)**	(250)	(284)	(352)	(148)	(292)	(158)
	=====	=====	=====	=====	=====	=====
Apparent Demand	5,059	5,259	5,155	5,391	5,339	5,500
Month End Stocks (million barrels)**	155.2	164.0	174.6	179.2	187.9	192.8
PADD I						
	<u>July (actual)</u>	<u>August</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Distillate + Jet Fuel						
Production	566	571	573	584	591	594
Imports	234	315	315	315	340	350
Exports	12	7	11	12	13	15
Net Transfers	929	1,060	1,085	1,160	1,260	1,310
Pipeline in (gross)	804	925	950	1,025	1,100	1,150
Waterborne in (gross)	210	220	220	220	245	245
Transfers out (gross)	(85)	(85)	(85)	(85)	(85)	(85)
Stock Withdrawals (+)**	(82)	(220)	(270)	(189)	(286)	(43)
	=====	=====	=====	=====	=====	=====
Apparent Demand	1,636	1,719	1,693	1,858	1,892	2,196
Month End Stocks (million barrels)**	45.6	52.4	60.5	66.3	74.9	76.3

Sources: Cambridge Energy Research Associates; US Department of Energy (historical).

*Assumes normal incentives to build inventories.

**Derived from projected production, imports, exports, and demand

Figure 1
US Primary Distillate Plus
Jet Fuel Inventories, 1996 to 2000

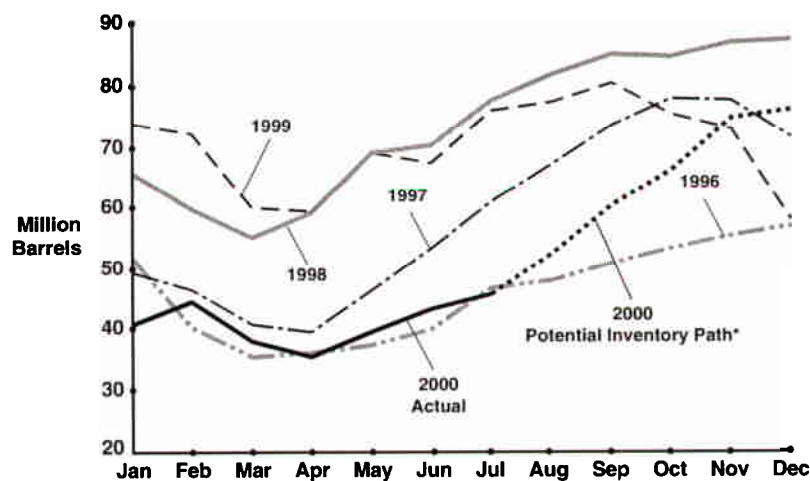


Source: Cambridge Energy Research Associates.

*Assuming normal incentives to build inventories.

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Figure 2
PADD I Primary Distillate plus
Jet Fuel Inventories, 1996 to 2000



Source: Cambridge Energy Research Associates.

*Assuming normal incentives to build inventories.

00814-1

Inventories in Europe—A Tighter Balance

Europe faces a tighter balance than the United States. Total middle distillate inventories (jet/kerosene and gasoil/heating oil combined) have fallen gradually throughout the year. Stocks usually increase over the second quarter, but this year primary inventories have declined such that at the end of July they stood at 320 million barrels, compared with 350 million barrels in January. This is at about the same level as in July 1997 but significantly lower than the high levels of July 1998 and 1999. On a forward-days basis, the inventory cover is about 3–4 days' less than in 1997, as European demand for middle distillates has increased steadily over the past three years at a compound rate of about 1.2 percent per year.

Closer to the key German market, independent stock levels of heating oil in the Amsterdam-Rotterdam-Antwerp (ARA) area (included in the above data) are about half the level they were a year ago. Consumer stock levels in Germany itself are estimated at between 55 and 60 percent of capacity—about 132–144 million barrels, sufficient for just under six months consumption at average winter demand rates. This is slightly below the level this time last year and significantly below the levels of 70–75 percent usually seen at the end of the third quarter.

Production and Demand

In the second half of 1998, with the incentive of a strong contango in the futures market, European refinery output was at its highest for many years, with average utilization levels estimated at 97–98 percent. At this time, total jet/kerosene and gasoil/heating oil production peaked at 6.22 mbd for the fourth quarter, compared with recent production rates of about 6.0 mbd in the first quarter of this year. At a conservative estimate, CERA believes it is quite plausible for refinery production of total middle distillates to average 6.1 mbd until the end of November, provided market conditions are favorable.

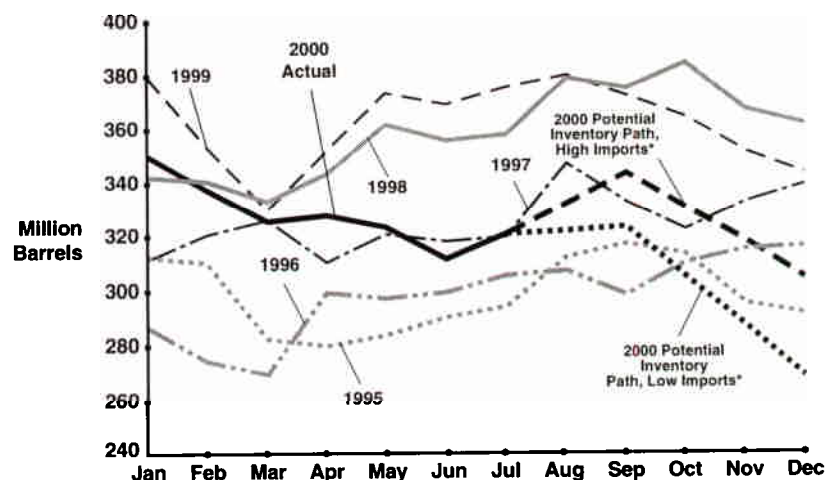
CERA forecasts demand to average 6.14 mbd in the third quarter, rising to 6.93 mbd in the fourth quarter, assuming German consumer stocks are rebuilt to typical preseasonal levels of 70–75 percent of capacity. With seasonal demand peaking well above regional refinery supply capability, this highlights the key role for imports in meeting European heating oil demand.

Imports—Russia Holds the Key

Western Europe has been a net importer of heating oil for many years, with the quantities increasing steadily in recent years. In 1999 net imports of jet/kerosene and gasoil/heating oil averaged 0.27 mbd, with first quarter imports averaging 0.42 mbd. Most of these imports have come from Russia, with some additional material from Algeria and Libya. In the first quarter of 1999, gasoil/heating oil imports from these three countries averaged 0.47 mbd. During the third and fourth quarters of 1999, Russia placed restrictions on gasoil exports, such that European gasoil/heating oil imports from Russia fell to an average of 0.21 mbd during that period. If no restrictions are in place this year, and so far there are few signs of any being implemented, then imports to Europe combined with refinery production should be sufficient to meet demand with no increase in inventories.

In the third and fourth quarters of 1999, net imports averaged about 0.08 and 0.24 mbd. At this level, primary inventories would fall to a very low level of 269 million barrels by the end of December (see Figure 3, "Low Import" case). However, in the first quarter of 1999 net imports averaged 0.41 mbd; at this level, primary inventories would build during the third quarter and finish December at about 305 million barrels (see Figure 3, "High Imports" case). This would still leave primary stocks at low levels relative to recent years. If primary stocks are to be increased to more "comfortable" levels by the end of November (to about 345 million barrels), this would require additional imports of 0.20 mbd.

Figure 3
EU plus Norway Primary
Middle Distillate Inventories, 1995 to 2000



Source: Cambridge Energy Research Associates.

*Assumes normal incentive to build inventories.

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Demand Sensitivity

Because of German consumers' ability to store large volumes of heating oil, German heating oil demand is particularly price sensitive. Consumer demand has been lower in the past 12 months than it was in 1998 and early 1999, when crude prices and thus heating oil prices were less than half their current levels. Given the large consumer storage capacity in Germany, it is not essential for stocks to build to the typical level of 75 percent by the beginning of the fourth quarter in order to meet winter demand. Levels of 60–65 percent can be sufficient if the winter is not unusually severe but would leave consumers with very low stocks at the end of the winter.

If German consumers do not rebuild stocks to typical levels for the end of the third quarter, total European demand for the balance of 2000 would be much closer to the low level of last year. This would reduce the projected import requirement to 0.26 mbd, assuming production stays at 6.1 mbd. If the net import levels of 0.41 mbd seen in the first quarter of 1999 can be repeated, that would allow primary stocks to increase by 20 million barrels by December 1—to a reasonably comfortable level.

Signposts

The tight, backwardated crude oil market lies at the origin of the current low middle distillate inventories. Hence, factors that indicate the possibility of a change in the tightness of the crude oil balance and in the shape of crude oil futures curve are key signposts to watch:

- **Crude oil imports and stocks in key consuming regions.** Reports of increases in import levels and a rebuilding of crude inventories in the United States and Europe in the coming weeks would take pressure off the market and support an increase in product stocks. However, continued low crude stock levels increase the risk of continued backwardation and a winter of tight distillate markets.

- **OPEC production policy.** A series of recent public statements by OPEC leaders has increased market uncertainty regarding OPEC output levels. Until a clearer picture emerges, this uncertainty is likely to support continued backwardation in the crude oil and distillate markets, hence slowing the pace of inventory building.

As highlighted above, in CERA's view the refining and logistics systems do have sufficient capacity to produce and transport middle distillates in sufficient quantity to rebuild stocks. However, there is little in the way of spare capacity above this level. Hence, factors that could affect the supply chain would risk further tightening the balance and so increase the likelihood of a tight winter heating oil market:

- **Maintenance.** Refineries and production facilities undergo periodic maintenance. Examples of events that could tighten the balance include significant refinery maintenance programs in the autumn and delays in completion of planned field maintenance programs.
- **Weather.** Extreme weather events have the potential to disrupt a number of links in the oil supply chain. For example, hurricanes can shut in crude oil production in the Gulf of Mexico and can cause the shutdown of US Gulf Coast refineries.
- **Other supply or logistics disruptions.** In a tightly balanced market, disruptions to logistics systems can contribute to significant tightening in product markets. For example, an accident at the Explorer pipeline contributed to the very tight US Mid-Continent gasoline market this summer. Likewise, unusually low or high water levels on the Rhine could limit the capacity to transfer product from ARA to the German market by barge.

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