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Gasoline Supply: The Role of Imports

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Lawrence C. Kumins
Specialist in Energy Policy
Resources, Science, and Industry Division

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Summary

Gasoline demand in the United States has grown consistently during the past decade, increasing by a total of 20%. Between 1999 and 2003, gasoline consumption grew by 500,000 barrels per day, accounting for all of the increase in petroleum consumption during that period. While 2004 may see growth slow down because of high prices, during the first seven months of the year gasoline demand was up by another 1.9%.

The fact that gasoline supply has not kept up with demand has been reflected in pump prices that have risen from $1.50 at the start of 2004 to as high as $2.06 per gallon in late May. When supply and demand become out of sync with their previous relationship, prices change to establish a new balance. The outcome has been a period of volatile gasoline prices, which have set record highs that have become a focal point for consumers and policy makers, and raised concerns about their impact on the economy.

Gasoline is supplied both by U.S. and foreign refiners. Domestic producers' capacity is limited. As a result, nearly 1 million barrels per day of gasoline and its components are imported. Imported blending components — especially those used in ethanol-blended fuel — are increasingly important to total U.S. supply. Without this supplemental supply, gasoline would be less available and prices likely higher.

Imports most recently have come from Canada and the U.S. Virgin Islands, which supply one-third of the off-shore supply. Argentina, the Netherlands, Russia, the United Kingdom, and Venezuela provide another third. Imports peaked in March 2004, took a dip, and reached new highs in July. Increased imports may have contributed to pump prices backing off their May highs in late summer.

New gasoline blending components from Venezuela and the rehabilitation of a refinery in Aruba may also contribute to enhanced gasoline component supply later this year. Gasoline component availability — which has increased during 2004 — gives domestic refiners an added measure of flexibility in using their capacity, and contributes to enhanced supplies of fuels needed to meet demand for ethanol-based gasoline and other specialized regional blends.

Potential policy concerns raised by growing reliance on gasoline imports include the availability of foreign supplies that meet U.S. specifications, whether incremental foreign supplies can be provided quickly enough to meet shifting demand, and the delivered price of imported gasoline.

Two legislative efforts were debated in the House regarding gasoline supply issues during 2004. One, H.R. 4517, has passed the House but not been taken up in the Senate. It would provide for easier permitting for refinery capacity expansion. And H.R. 4545, which did not pass the House, would have limited the growth of special regional fuel blends, often called "boutique fuels."

This report will be updated as events warrant.

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Introduction

Average U.S. gasoline prices have risen sharply during 2004, beginning the year at $1.50 per gallon and peaking at $2.06 in late May. They subsequently declined to $1.87 in August as inventories increased.

Among the factors causing 2004's gasoline price volatility has been a shortage of domestic refining capacity, which has affected gasoline supply availability, creating a need for substantial imports. U.S. gasoline imports — in the form of conventional gasoline, reformulated gasoline, and gasoline components — currently make up slightly more than 10% of the nation's supply.

Potential policy concerns raised by growing reliance on gasoline imports include the availability of foreign supplies that meet U.S. specifications, the speed at which incremental foreign supplies can be provided to meet shifting domestic demand, and the delivered price of imported supplies.

The nation's stressed gasoline supply capacity has attracted recent legislative interest.

In the House, the Gasoline Price Reduction Act (H.R. 4545) was brought to the floor under suspension of the rules (passage requires a two-thirds vote) on June 15, but failed by 236-194. The bill was intended to increase gasoline availability by limiting the number of fuel blends required to meet clean air standards and by allowing waivers of fuel blend requirements during supply disruptions. This would have made it easier to ship gasoline between markets when needed to balance supply.

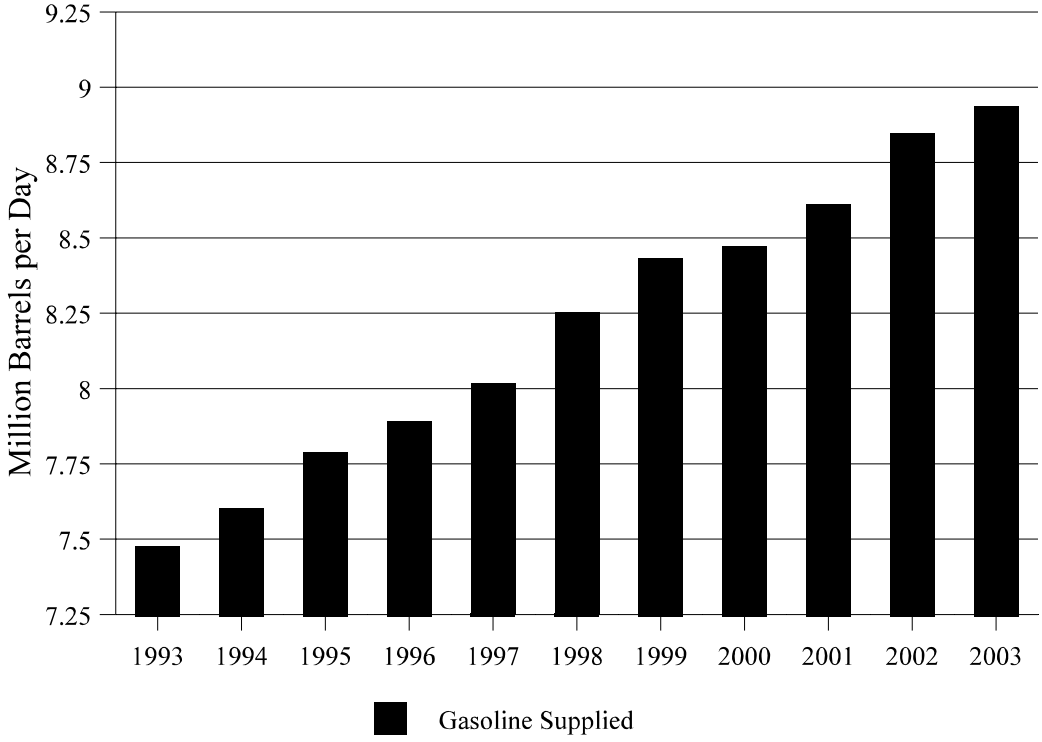
On June 16, the House passed the United States Refinery Revitalization Act (H.R. 4517) by a vote of 239-192. This bill would provide incentives to increase refinery capacity, focusing on areas with closed refineries or those experiencing layoffs or high unemployment. It would also charge the Department of Energy (DOE) with centralizing the process of obtaining environmental permits for new refinery projects, including additions and upgrades.

Gasoline Demand

Gasoline demand in the United States continues to grow. Although gasoline comprises about 45% of total U.S. petroleum consumption, its incremental growth during the recent past accounts for virtually all of the increase in total oil demand.

Figure 1 shows the trend in U.S. gasoline consumption during the past decade, during which demand rose 20%. Growth has persisted in more recent years, although 2004 may see some late-year slowdown because of higher prices. Between 1999 and 2003, petroleum consumption increased by half a million barrels per day (mbd), rising from 19.5 mbd in 1999 to 20.0 mbd in 2003. During the same time span, gasoline consumption rose by the same amount as demand grew from 8.4 mbd to 8.9 mbd.

Figure 1. U.S. Gasoline Demand: 1993 - 2003



Source: Energy Information Administration, Monthly Energy Review, June 2004, Table 3.4.

Gasoline use has continued to grow during the first half of 2004, as almost 9.0 mbd of gasoline was supplied to consumers, an increase of about 1.9% over the previous year's first half. While there is some preliminary evidence that high pump prices may have begun to retard growth in gasoline demand, it is still too soon to evaluate whether this trend has shifted, and how overall petroleum demand might track for all of 2004.

Gasoline Supply

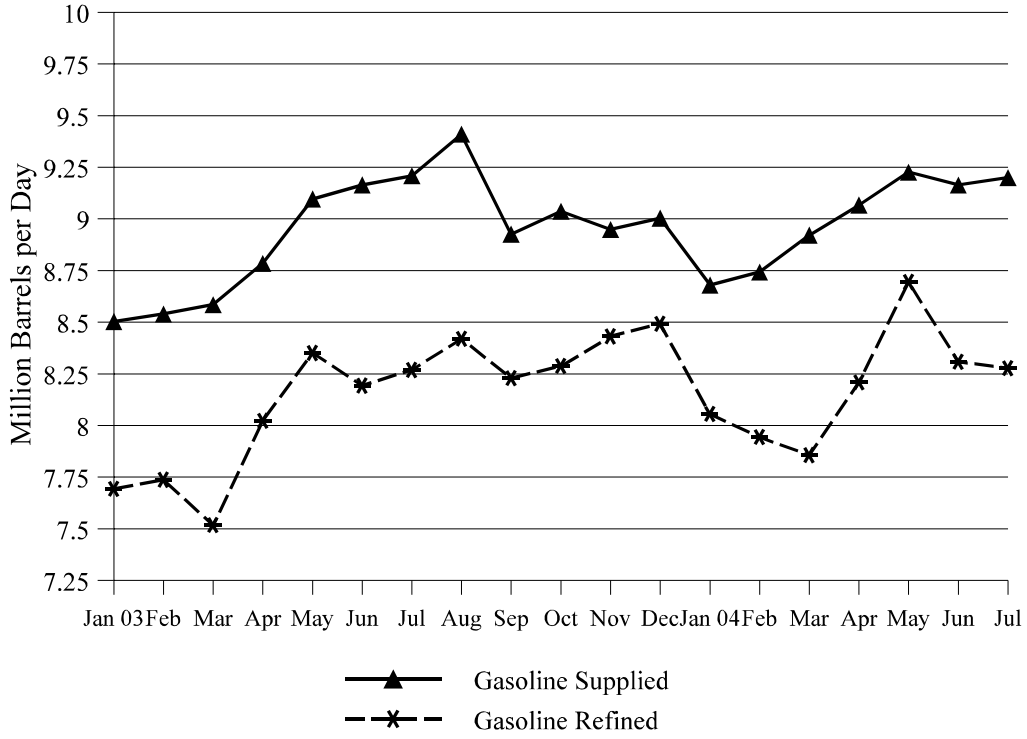
Gasoline is manufactured in U.S. refineries and imported from foreign refiners as well. **Figure 2** shows data for total U.S. demand and domestic production.[1] The gap between the two sets of figures is filled by imported product made by foreign

[1] U.S. production is represented by gasoline production data (which includes foreign blending components) from Table 2 of the *Weekly Petroleum Status Report,* adjusted to reflect the inclusion of imported blending components, as shown in Table 9.

refiners. Imported supply consists of finished gasoline — which meets U.S. specifications and is market-ready — as well as blending components.

The latter have become an increasingly important part of gasoline supply, since an increasing amount of ethanol-blended gasoline is being consumed in this country. The trend toward ethanol blends may continue because it is the oxygenate used to replace the additive methyl tertiary butyl ether (MTBE), which has been banned in New York, California, and Connecticut, and is being phased out in other places.

Figure 2. U.S. Gasoline Production & Demand: Jan. 2003 - July 2004



Source: EIA, Weekly Petroleum Status Report, June 30, 2004, Table 10.

In one form or another, the nation imports slightly more than 10% of the gasoline it consumes, the unavoidable outcome of growing motor fuel demand and refining capacity which has not kept pace. This supply is necessary to fill the gap between gasoline production and demand shown in Figure 2.

Figure 3 shows the imports of gasoline in detail, the total of which is rising in the time-frame in this figure. Total imports peaked this summer at about 1.1 mbd; for the first seven months of 2004, they averaged 900,000 barrels per day.

Imports fit into three general categories:

- Conventional gasoline, which comprises about half of the gasoline sold in the nation and conforms to the least stringent environmental standards currently in effect. The U.S. environmental standards for

this fuel include a prohibition on the use of lead, limits on summertime volatility, and limits on manganese and sulfur content.

- Reformulated Gasoline (RFG) is used in major metropolitan areas in 17 states and the District of Columbia which have significant ozone problems. In April 2004, EPA designated areas in a total of 32 states and the District as nonattainment areas for a new ozone standard to be phased-in between 2007 and 2021 [2]. RFG has several requirements, including the mandate that it contain sufficient oxygenates to meet a minimum oxygen requirement of 2% by weight. The oxygenate often added is either the chemical MTBE (now banned in several states) or ethanol. RFG's peak usage is during summer months, when it comprises about 29% of national demand.

- Gasoline components are imported with increasing frequency, amounting to 50% of imports during 2004. Gasoline is a "cocktail" of hydrocarbons blended at refineries and fuel terminals. Increasingly, cocktail ingredients are available from foreign refiners, and they are being imported to expand U.S. refinery output. Since finished gasoline is a blended product, refiners can supplement short capacity by buying foreign components and blending them here in such a way that U.S. specifications are met.

As a result of the Clean Air Act requirements and state mandates, many different types of gasoline are sold in the United States. In addition to conventional and RFG, there is oxygenated fuel (higher oxygen content than RFG), low volatility conventional gasoline, and a variety of state and local blends. These "boutique fuels" include ethanol blends, California Cleaner-Burning Gasoline (also used in Nevada and Arizona) and a number of other local formulations.

As noted above, the trend toward ethanol blends may continue because it is the oxygenate used to replace the additive MTBE. Ethanol blends cannot be stored or transported by pipeline, because ethanol and gasoline do not mix well and can separate. The blend must be mixed near the point of final consumption.

Imported components of the gasoline "cocktail" fit into the increasingly common practice of local blending for local markets, in that "cocktail" components often come from multiple sources and are assembled at terminals and other gasoline distribution points. For refiners, blending gasoline from component parts represents a small incremental supply bonus, since they can purchase opportunistically those components that might be available on world markets, and manufacture the remainder in their own facilities. In total, U.S. refiners do not have the capacity to make all the gasoline sold in this country, but they often do have substantial flexibility — within overall capacity constraints — to make hard-to-import

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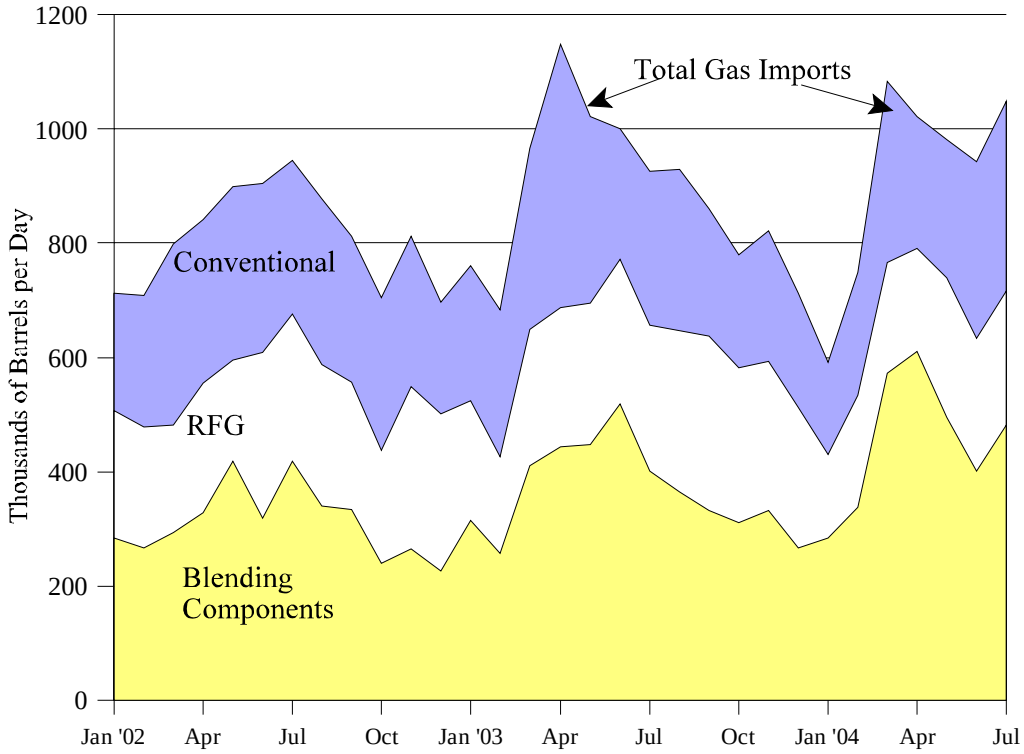
[2] For a full discussion of the new ozone standards, see CRS Report for Congress RL32345, *Implementation of EPA's 8-Hour Ozone Standard*, by James E. McCarthy.

components tailored to U.S. specifications which foreign refiners cannot easily provide.

The trend shown in **Figure 2** suggests that U.S. refiners are able to produce during an average month a bit more than 8.0 mbd, while demand is trending just under 9.0 mbd this year. The actual numbers fluctuate from month to month. **Figure 3** shows total gasoline imports averaging about 900,000 barrels per day.[3] Imports of finished gasoline and components — which have averaged, respectively, about 500,000 barrels per day and 400,000 barrels per day during the past 12 months — bridge the gap between U.S. refinery production and demand. Without this supplement, there would be a supply shortfall.

Figure 3. Make-up of U.S. Gasoline Imports: Jan. 2002 - July 2004



Source: EIA, Weekly Petroleum Status Report, August 2, 2004, Table 9.

The increasing use of blending components in building up the gasoline pool is seen in the rise of components as a proportion of nationwide gasoline inventories. **Figure 4** shows that total gasoline stocks started 2003 at essentially the same level (212 million barrels) that they were at the end of August 2004 (206 million barrels). But blending components held in inventory rose from 54 million barrels, or 26% of inventory, to 72 million barrels, or 35% of total inventory. This is a substantial increase, and shows refiners' demand for stocks of components to meet the need for locally-mixed ethanol blends as well as diverse boutique fuels.

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[3] Energy Information Administration, *Weekly Petroleum Status Report*, Table 9.

Boutique Fuel Supply Issues

Fifteen states have chosen to address clean air issues by calling for localized gasoline formulations for all or part of their states[4]. Many of these requirements are in effect during summer months when concerns about ozone are greatest.

The diversity of fuel formulations has raised concerns among stakeholders regarding refiners' ability to provide the diversity of products required in sufficient quantities as well as the product transport sector's ability to distribute the diverse product slate. In its Staff White Paper on Boutique Fuels,[5] the Environmental Protection Agency (EPA) contends that the refining and distribution system works well under normal operating conditions. But the agency notes that when the entire fuel market is stressed, the places where supply shortfalls and volatile prices tend to show up first and be most acute involve geographically isolated fuel programs.

Many state boutique programs are of this nature, and have fewer suppliers and fewer transport options. In situations where there is a transportation failure, a supply shortfall of gasoline components, or some combination of these and possibly other factors, prices can become very volatile as small supply glitches impact an isolated local market disproportionately. There appear to have been few such instances, but some have taken place.

The experience in the Chicago metro area during the spring of 2000 is one example of how a confluence of circumstances can play out. As the Chicago metropolitan area transitioned to ethanol-blended gasoline in the late spring of 2000, a key pipeline supplying gasoline from the Gulf Coast refining area failed. The supply shortfall from traditional refiners — coupled with the initial difficulty in making reformulated gasoline blendstock for oxygenate blending in local refineries — combined to create a tight regional supply situation, which saw pump prices nearly double in May and June.[6] But by July, supply from other sources and restoration of pipeline flow began to return prices to accustomed levels. The price spike, while only a few months in duration, was substantial, and is often pointed to as a "worst case" situation of how a convergence of mishaps can lead to a substantial disruption in a market delineated by boutique fuel requirements.

EPA notes that problems of this type to date have been limited in terms of geographical scope and duration. It appears that the fuel supply system can support the current structure of fuel standards, absent some set of untoward circumstances.

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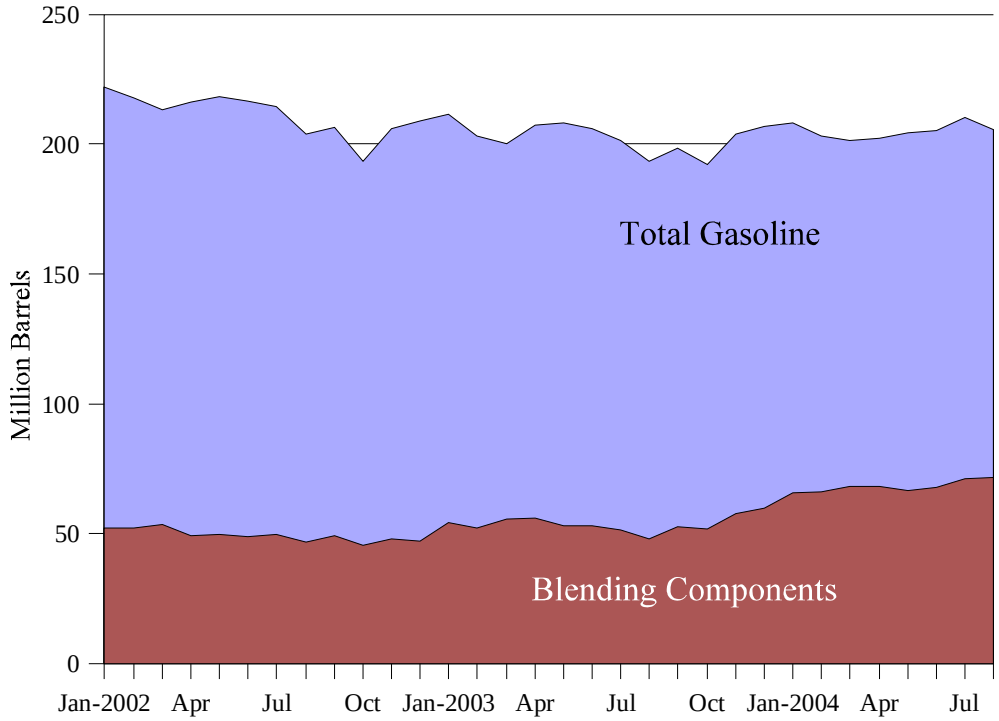
[4] A full discussion of boutique fuels, see CRS Report for Congress RL31361 "*Boutique Fuels" and Reformulated Gasoline: Harmonization of Fuel Standards*, January 9, 2004.

[5] Environmental Protection Agency, *Study of Unique Gasoline Fuel Blends ("Boutique Fuels"), Effects on Fuel Supply and Distribution and Potential Improvements*, October 2001. See pages 2 to 4.

[6] See *Midwest Gasoline Prices: A Review of Recent Market Developments*, CRS Report RL30592, June 2000. Also see Final Report of the Federal Trade Commission, *Midwest Gasoline Price Investigation*, March 29, 2001.

Most stakeholders, EPA contends,[7] are instead concerned with the proliferation of boutique fuels into the future and would like to see limits on new boutique fuel requirements.

Figure 4. U.S. Gasoline Inventory: Jan. 2002 - Aug. 2004



Source: EIA, Weekly Petroleum Status Report, August 25, 2004, Table 3.

Where Do Gasoline Imports Come From?

Currently, one-third of gasoline imports comes from Canada and the U.S. Virgin Islands. Another third comes from Argentina, the Netherlands, Russia, the United Kingdom, and Venezuela; the remainder is imported in smaller quantities from a diversity of nations.

Figure 5 illustrates trends in overall gasoline imports, as well as various suppliers' shares of the imported gasoline market. It also shows how the amounts supplied by each important supplier can vary from month to month, as well as changes in the overall supply of imports.

Canada — source of much of the nation's hydrocarbon imports — is the single leading supplier of gasoline on a regular basis. Canada's exports have increased steadily during recent years. And the U.S. Virgin Islands — location of the very large Hovenessa refinery, jointly owned by Amerada Hess and the Venezuelan national oil company Petroleos de Venezuela (PDVSA) — is also a consistent source of supply.

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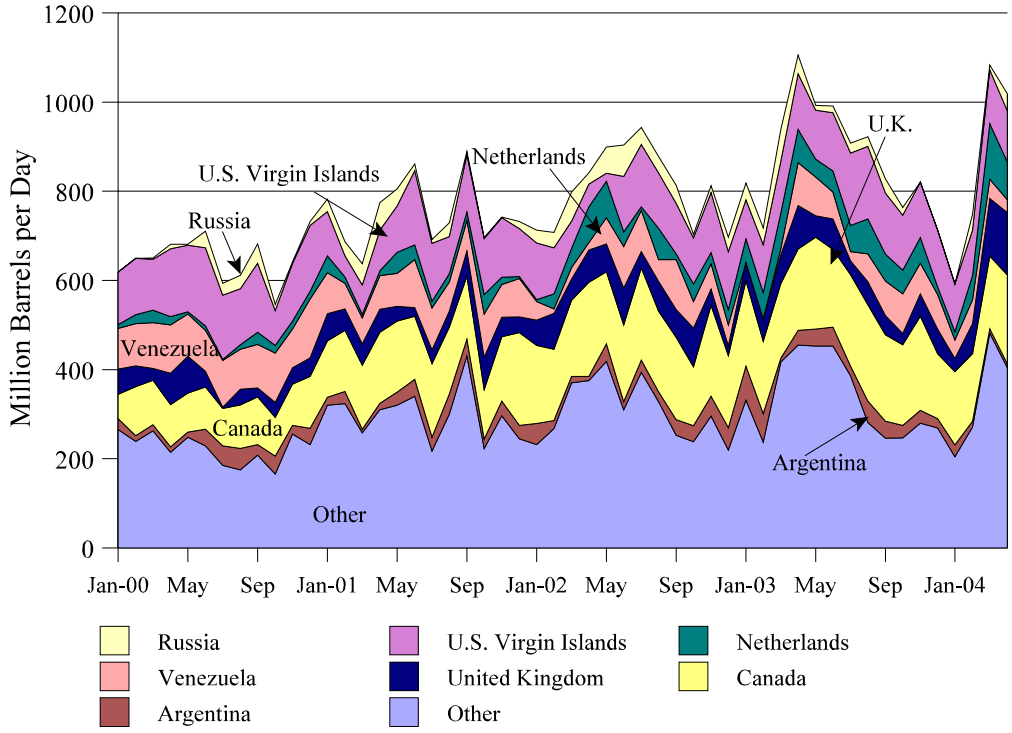
[7] EPA, op cit. p 4.

But imports from the other major suppliers fluctuate monthly. Even Venezuela has experienced difficulties in meeting its historic refinery output levels since an oil workers strike in late 2002. Venezuelan gasoline exports to the United States have dropped to about 40% of levels seen prior to 2002's political disruption. Recent efforts to regain U.S. market position by PDVSA (discussed below) could produce a supply benefit, although refinery operations are still recovering from the strike.

Figure 5. Average Daily Gasoline Imports by Country of Origin Jan. 2000 - Apr. 2004



Source: EIA, June 2004.

In addition to Canada and the Virgin Islands, increased gasoline imports now come from the United Kingdom and the Netherlands, where refinery utilization is much lower than in the United States; many other nations with spare refinery capacity are suppliers as well.

A recent enhancement to the supply of imported gasoline has been made by PDVSA, which has started shipping the complete cocktail for ethanol blended gasoline (without the ethanol, which is blended near the point of sale). PDVSA has planned to export 1 million barrels per month of this high-priced component, called RBOB,[8] starting with test cargoes in June. *Platts Oilgram Price Report*[9] noted that 720,000 barrels were exported in July, and the extra barrels in the U.S. market have

[8] This is an acronym for "reformulated before oxygenate blending."

[9] "European Gasoline Sellers Lose U.S. Market Share to Cheaper Venezuelan Exports," *Platts Oilgram Price Report*, July 26, 2004. p. 1.

provided extra competition for comparable cargoes from Europe, where distances and shipping costs are greater. This illustrates the significance of the supply of foreign gasoline components, and how they can impact U.S. gasoline prices.

It is likely that high U.S. prices for gasoline and its significant components will continue to attract foreign refiners' attention, perhaps leading them to seek permanent market share. PDVSA — which also owns U.S. refiner CITGO, affording direct retail market access — announced that for September it planned to export 12 RBOB cargoes to the United States, including four or five for the New York-Connecticut ethanol-only blended markets.[10]

Another example of what may be taking place in off-shore refined product supply is the revitalization of a large refinery in Aruba that was recently acquired by Valero Energy, an independent refining company with most of its facilities in the United States.

While geographically well-positioned to serve U.S. markets, this facility had an unsuccessful operating history. Valero began improving operations quickly and is adding upgrading units so that gasoline components can be made in increasing quantities from low-quality crudes. The capacity of this refinery is 275,000 barrels per day, a figure which suggests that it could — when it reaches capacity — contribute significantly to Gulf and East Coast gasoline supplies. Imports from Aruba are so recent that they are not reflected in DOE data (which lag by a few months) on product imports by country.

Imported Gasoline — Is the Nation Overly Dependent?

Dependence on imports to meet over 10% of national gasoline needs has begun to cause concern that these imports might contribute to 2004's high prices. While supplies from Canada may have similar physical characteristics and prices to the output from U.S. refiners — and offer speedy delivery — products from refineries farther afield may not. Factors such as the cost and timeliness of incremental supply, physical reliability, and meeting U.S. product specifications can affect price and supply at the gas pump.

Shipping cost may be an additional issue. Gasoline and many other refined products need to be protected from contamination from other oils. As a result, they must be shipped in clean vessels. These product carriers are usually much smaller than crude carriers, and — not benefitting from economies of large scale — have higher unit costs. In addition, the clean tanker market is influenced by spot charter rates for vessels, making product shipping costs often higher and more volatile than

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[10] E-mail from Fadi Kabboul, Minister Counselor for Energy Affairs, Embassy of Venezuela. Aug. 20, 2004.

crude oil. It is cheaper to ship crude to a local refinery than to transport products an equivalent distance.[11]

Imported products cost more than those refined domestically simply by virtue of transport costs. The higher import costs impact the last units of gasoline supply, providing a price umbrella for domestic refiners, whose pricing — like all industrial pricing — is linked to the cost of the last increments of the good involved. As long as gasoline is imported to meet a sizeable imbalance between domestic supply and demand, this situation offers a likelihood of prices which are above the cost of domestic manufacture. This assumes that new domestic refining capacity to replace imports could produce U.S.-spec gasoline at costs below those of foreign refiners plus product transport tariffs to the United States.

In addition to price-related considerations, the speed of supply response to price signals from U.S. gasoline markets seems less than it might be from a refiner located here. It may well be that distance mutes price signals related to an increase in demand, for example, and refiners abroad may be slow to receive the message that U.S. consumers desire more gasoline and are currently paying prices which would justify a foreign refiner's manufacturing of U.S. specification fuel. Even if the foreign refiners' response to U.S. prices were instantaneous, it could take as long as a month — in some cases more — for the physical supply to arrive here.

Manufacturing fuel for the U.S. market may be another source of delayed response to U.S. market signals. Some of the substances called for in satisfying U.S. fuel needs may not be produced in the ordinary course of refinery runs abroad. And some — like RBOB — are difficult for many refiners to make, calling for a longer set-up time.

Lags in getting foreign supply may have contributed to 2004's price increases. **Figure 3** shows low imports during late 2003 and early 2004, which corresponded to a decline in gasoline inventories and consistent price increases seen throughout the first half of 2004.

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[11] The Energy Information Administration (EIA) described the economics of attracting imported gasoline to the United States in its *Summer 2001 Motor Gasoline Outlook*, showing how the incremental cost of transport must be surmounted. It notes that "...Western Europe is an important source of incremental or swing gasoline supply in the United States. Trans-Atlantic gasoline price differentials provide some indication of the attractiveness of the U.S. market to European refiners. When U.S. prices exceed European prices adequately to cover transportation costs ...," the United States will attract supply from refineries located there. EIA notes that Europe-U.S. gasoline transport costs vary greatly, while averaging 4 cents per gallon as imputed by wholesale price differentials. But the data shown on the graph accompanying the discussion indicate differentials as high as 14 cents per gallon, and year-long periods averaging 8 to10 cents per gallon. These figures embody the costs of shipping presumably imported crude to a refinery in Europe, so they embody crude transport costs. According to EIA figures, crude transport to the U.S. from the Persian Gulf averaged $2.37 per barrel (5.6 cents per gallon) during 2003.

Is dependence on gasoline imports for more than 10% of the nation's gasoline supply undesirable? In theory, importing gasoline may have few drawbacks. It might make little difference if this fuel were to be supplied from across the border in Canada. The products supplied might be U.S.-specification conventional gasoline or RFG. What about imports from a refinery operated by a major international oil company in Europe or nearby in the Caribbean? At what point does foreign refined product dependence become a policy concern? There is no clear answer, but major considerations in evaluating this question include:

- Availability of supplies meeting U.S. specifications, so that demand can be met without the need for waivers that could compromise environmental protections.

- The speed with which incremental supply might be available, given just-in-time gasoline inventories, in order to avoid excessive price volatility.

- The delivered price of foreign supplies, and whether they are above the incremental price of domestic output, such that they ultimately contribute to higher prices.

Policy and Legislation

The nation has no apparent defined policy on refined oil product imports, nor is there a policy regarding gasoline prices. There is a general perception among policymakers that price volatility is undesirable, but there is no consensus on what the price level ought to be. Nor is there consensus about how the government might deal with market volatility. Similarly, there appears to be general agreement that spot shortages — run-outs and lines at gas stations — are to be avoided. But there are no guides for policy actions to remedy such situations should they take place, and it could be that letting market forces make corrections without government involvement would be the better course of action.

Some policy initiatives in the 108th Congress are embodied in two House bills focusing on the proliferation of regional gasoline blends and expanding refinery capacity. H.R. 4545, the Gasoline Price Reduction Act, centered on the proliferation of special, local boutique gasoline blends. The bill failed to get the required two-thirds House vote for passage under suspension of the rules. It would have authorized EPA during significant supply disruptions to issue waivers of state provisions requiring boutique fuels. The boutique fuel requirement is seen as potentially limiting supply by impeding the movement of fuel between areas; a shortage in one spot might not be met with extra fuel from a nearby area because of differing requirements. The bill also proposed capping the number of boutique fuels at the current level.

H.R. 4545 proposed dealing with supply fungibility; but it did not offer remedies that could have increased the supply of domestically produced gasoline. H.R. 4517, the Refinery Revitalization Act — which passed the House, but has not

seen Senate action — is aimed at facilitating increases in capacity by fast-tracking the environmental review and permitting of facilities in a designated Refinery Revitalization Zone. The Secretary of Energy would designate the zones, coordinate environmental reviews, and make final decisions on federal authorizations for new refineries within the zones. To the extent that those wishing to construct a new refinery — or expand an existing facility — have been hindered by environmental regulation, this measure is intended to offer some assistance.

These bills articulate at least some components of a gasoline supply policy, dealing with domestic supply and indirectly with imports, and with fuel specifications that impact the distribution of supply. Both measures have drawn substantial criticism, however, particularly on environmental grounds. For example, with regard to the refining bill, opponents express concern that such a measure would override state clean air programs. Among its cons, H.R. 4545 raises concerns about the overall cost of gasoline, given that many state programs which avoid full-fledged RFG have been implemented to keep down gasoline costs.

The refining proposals attempt to address the 1 mbd gasoline production shortfall, which is made up by imports in one form or another. Encouraging growth in domestic refinery capacity implies a judgment that it is advantageous to have that capacity in the United States, in contrast to offshore, even if offshore is relatively nearby. As noted above, domestic production could reduce transportation costs and provide quicker supply response to unanticipated changes in demand. This could shorten the duration of a potentially disruptive price spike resulting from a gasoline supply shortfall.

Refinery proposals under current debate do not address other issues impacting refinery projects, such as an historic lack of profitability in this industry segment[12]. It may well be that the current refining situation — with imports holding a "price umbrella" over domestic gasoline production — may be a profitable situation for many refiners, many of whom are realizing record earnings in the first and second quarters of 2004. While this year's earnings may be high, one year's experience does not outweigh years of low profits. While a basic change in refiner profitability might be suggested, it is too soon for many firms to consider making significant investments in long-lived capital equipment, whose cost is recouped over many years.

Were the prospects for long-term profitability in the refining industry to improve by virtue of a sustainable recovery in refining margins, it is likely that additional investment in added capacity would be seen. But it might take several years of high margins before firm managers and their bankers would become confident enough to make substantial capital commitments.

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[12] For a more extensive discussion of refinery profitability, see CRS Report RL32248: *Petroleum Refining: Economic Performance and Challenges for the Future*, March 1, 2004.