

Bottom of the Barrel: An Updated Outlook for Residual Fuel Oil 2012 Edition

OVERVIEW

The next 15 years will witness radical shifts in the supply/demand balance for residual fuel oil and other heavy products, which will have profound impacts on crude and product pricing and refining margins. On the demand side, the traditional demand sectors for fuel oil in power generation and industrial heating have been declining as substitution to coal and gas has taken market share in the industrialized world. However, these uses are nearing practical minimums in mature markets, limiting the potential for further reductions. Other residual fuel demands — notably for bunkers, asphalt, and power/industrial demand in key areas of the developing world — are still growing. **Consequently, PIRA expects that in contrast with the last 15 years, global end-user demand for heavy products in total will level off, or even grow, in the future, partly depending on how aggressively bunker fuel sulfur specifications are tightened.**

On the supply side of the equation, the story is also changing. A tremendous surge is occurring in refinery fuel oil conversion capacity. This step change is more than what is needed to balance incremental crude supply with light/heavy product demand growth. **Over the next several years, this new coking, hydrocracking, and catalytic capacity, much of it in the developing world, will weigh on refining margins, forcing changes in pricing relationships and trade patterns.**

Together, these forces will impact product price spreads, crude differentials, and refining margins. **PIRA will assess the impact of these forces in a new multi-client study due for release in March 2012, BOTTOM OF THE BARREL: AN UPDATED OUTLOOK FOR RESIDUAL FUEL OIL.**

This study expands on, and brings up-to-date, a similar PIRA study issued in 2007. Although the broad outlook trends addressed in the 2007 study generally are still true, much has changed since then: the global recession and its aftermath, the IMO's approval of bunker sulfur regulations, the rise of oil production from shale, the increase in world oil prices to over \$100/Bbl — to name a few. These changes, along with a broad-based interest by PIRA's clients, have led to this new expanded study.

BOTTOM OF THE BARREL 2012 includes:

- **An in-depth outlook of the factors driving each region's future fuel oil and other heavy product usage.** Demand trends by region/country and by sector will show how decreases in some areas are being offset by increases in others. The impacts of upcoming changes in bunker sulfur specifications will be discussed in detail.
- **A detailed look at the production of heavy products, examining changes in crude slate, refinery runs, and refinery fuel oil conversion.** Refinery capacity trends will drive straight-run feedstock balances tighter, while cracked stocks remain more amply supplied.

- **Analysis of the trade flows for residual feedstocks and fuel oil and how they will evolve** as supply, demand, and product quality requirements change.
- **Regional price forecasts relative to crude and other products**, residual fuel oil quality differentials, prices relative to competing fuels, arbitrage opportunities, and the key factors that will drive these relationships.
- **Regional reference case projections through 2025**, by year, as well as alternative scenarios that test the impact of key variables on those projections.

WHAT DO STUDY SUBSCRIBERS RECEIVE AND WHEN

Companies purchasing the study will be entitled to have three users to each of the following deliverables (licensing options are available to add extra users):



WRITTEN REPORT (March 2012 release)

Spells out the findings of the study and the bases underlying those results, and provides a discussion of the key uncertainties that impact the major findings. Approximately 200 pages long, the report includes an executive summary, as well as detailed discussion and illustrative charts on: Demand, Supply, Quality, Price, Trade, and Alternative Scenarios.



ONLINE DATABASE (March 2012)

A comprehensive database providing historical data back through 1995 and forecasts through 2025 in Excel spreadsheets for:

- **Country-level demand by sector** with quality breakouts
- **Regional crude production and refinery runs** with quality breakouts
- **Regional resid supply**, with the impact of refinery capacity changes on fuel oil blending
- **Inter-regional residuum trade flows**
- **Price forecasts**, both absolute and relative to crude/products, by region and quality



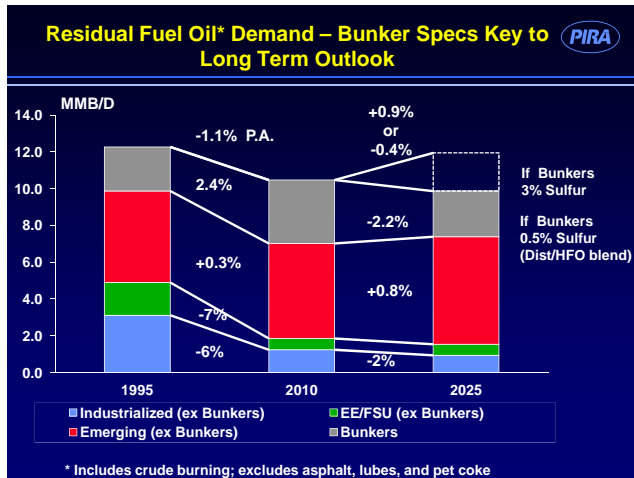
STUDY PRESENTATION (April 2012)

Clients will have the opportunity to see a presentation of the key results, discuss those findings and their implications, and question the study's authors in a briefing to be held after the report and database are released. Although the exact timing of the briefing has not yet been determined, it will be Webcast live and recorded for later review via PIRA's website for study subscribers.

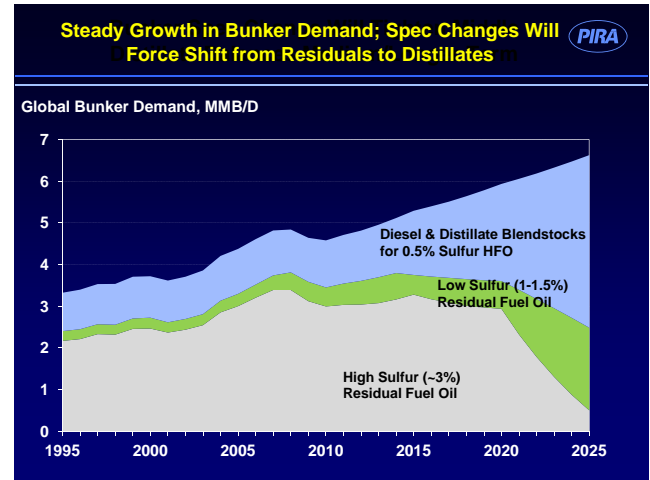
WHY THE TIME IS RIGHT FOR THIS STUDY

A Fresh Look at Demand Trends

The long historical decline in fuel oil demand is expected to level off or even grow in some scenarios. Substitution to other fuels for power generation in the OECD, FSU, and other industrialized countries is nearing practical minimums. In the developing world, further growth in stationary uses is still likely, but not broadly based. Most expansions are concentrated in oil-exporting countries and in rapidly developing countries struggling to meet electricity demand growth.



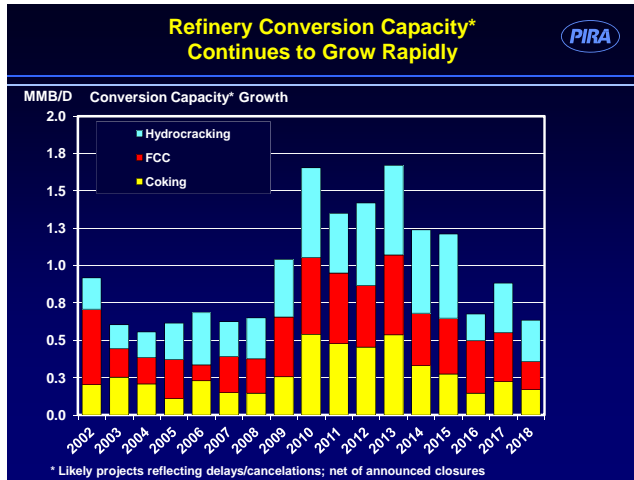
Bunker demand, on the other hand, continues to grow robustly as the vessel fleet grows to meet expanding trade, and it will represent an increasing share of total fuel oil demand. However, tighter bunker sulfur specifications may drive demand further to low sulfur residual or even distillate based fuels, although the manner and schedule for implementation is still uncertain.



BOTTOM OF THE BARREL 2012 will examine demand trends for power generation, industrial use, bunkers, and asphalt/lubes/other specialties. Regional/country forecasts are included. Factors influencing these trends — including policy, substitution due to competitive prices, efficiency improvements, quality requirements, and the potential use of scrubbers for shipping — will also be addressed. Demand scenarios that test the impact for a range of possible economic and regulatory factors will provide bounds around PIRA’s Reference Case forecast.

A New Assessment for Fuel Oil Supply

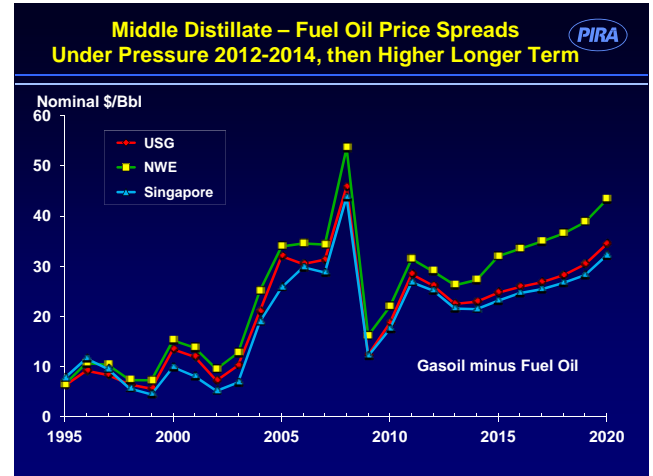
With demand for light products growing much more rapidly than that for fuel oil, ongoing additions to fuel oil conversion capacity are required to balance supply and demand. Over the last few years, capacity additions have rapidly increased, and now exceed current requirements. This surge will continue for the next few years and will tighten straight run fuel oil balances and tend to keep light-heavy product price spreads narrow.



Rapidly Changing Price Relationships

With these changes in demand trends and refining capacity will come dramatic changes in pricing relationships. The study will address these impacts. Changes in residual fuel oil prices relative to other products and crude will be

quantified. Quality and regional differences will be described.



These changes in product price spreads will fundamentally affect refinery margins, inter-regional arbitrage opportunities, and crude price differentials.

BOTTOM OF THE BARREL 2012 will show how a detailed and nuanced look at the underlying trends builds up to robust conclusions for the future.

The study also answers these important questions:

- 1) To what extent will the global balances for residuum tighten, and what will be the new marginal refining steps that drive margins and crude differentials?
- 2) How will bunker fuels sulfur regulations impact demand and price? Will scrubber technology be a major factor?
- 3) How are the balances for low-sulfur expected to be different from high-sulfur fuel oil?
- 4) What are the changes in trade patterns and arbitrage relationships that can be expected?
- 5) How will fuel oil blending components change in different regions?
- 6) What will be the impact on light-heavy product prices, low sulfur-high sulfur fuel oil prices, and light-heavy crude differentials?
- 7) What would be the impact if the global economy grows more slowly than expected in the Reference Case? Or if it grows more robustly?
- 8) Will the changes in heavy product demand, supply, and refining be fundamentally different in the developing world versus the mature industrialized world?

WHO WILL BENEFIT FROM THIS STUDY

The stakes are high when it comes to making decisions regarding future residual fuel oil/other heavy product supply, demand, and pricing. **BOTTOM OF THE BARREL: AN UPDATED OUTLOOK FOR RESIDUAL FUEL OIL, 2012 EDITION** will help market participants keep ahead of the competition through a better understanding of the future interplay between regional residuum balances, regional pricing for different qualities, inter-regional trade, and the impact of these factors on refining margins. The following market participants will all benefit from this study:

- **Crude producers** know the importance of product supply/demand balances, product values, and refinery capacity in setting crude price differentials. This study will help them identify and evaluate the future refinery value for heavy versus light crudes and heavy crude upgrading.
- **Refiners** need to plan capacity changes based on the outlook for product demand, feedstock supply, and relative pricing. By providing a firm basis in evaluating future changes in these factors, which define refinery fuel oil conversion margins, the study will help refiners evaluate the future profitability for different refinery configurations.
- **Trading companies** want to anticipate regional supply/demand changes and price dynamics. This analysis will aid in planning terminal and shipping infrastructure needs to best capture future opportunities.
- **Shipping companies** know that their single largest expense is for bunker fuel, and they face uncertainty both on its price and regulations on quality. **BOTTOM OF THE BARREL** will provide a residual fuel oil price basis under different demand/regulatory scenarios.
- **Policy makers** need timely insight into how proposed changes in product quality regulations will affect supply, demand, price, and industry profitability. This study will enable them to better evaluate the impact of future regulatory changes.
- **Electric utilities and other end-users** constantly consider how changing fuel oil price dynamics will influence service choices and future capacity decisions. The study will make end-users better equipped to adapt to supply and price shifts, and help new project developers make more effective evaluations of fuel supply options and project viability.
- **Financial institutions** must make sound evaluations of how changing market conditions will affect the economics and financing of new refining and marketing ventures. This study will allow for more informed decision-making on potential projects.

FEES AND OPTIONS

BOTTOM OF THE BARREL: AN UPDATED OUTLOOK FOR RESIDUAL FUEL OIL, 2012 Edition can be purchased by both PIRA retainer clients as well as non-clients. **Existing PIRA retainer clients receive a reduced price. Also:**

- **Buyers of PIRA's 2007 Study** **BOTTOM OF THE BARREL: THE FUTURE FOR RESIDUAL FUEL OIL** can receive an additional discount.

Additional users (beyond three), extra report copies and database passwords can also be purchased. For detailed service pricing options, see the Acceptance Form on page 8.

ABOUT PIRA ENERGY GROUP

The PIRA Energy Group, founded in 1976, is an international energy consulting firm, offering Retainer Client Services as well as customized consulting on a broad range of subjects in international oil, natural gas (and LNG), coal, electricity, biofuels, freight markets, and related environmental issues. PIRA provides evaluation of key U.S. and international energy issues that impact the behavior and performance of the industry and its various markets and sectors. Currently, more than 550 companies worldwide retain PIRA, including international and national integrated oil and gas companies, independent producers, refiners, marketers, oil and gas pipelines, electric and gas utilities, industrials, trading companies, financial institutions, and government agencies.

PIRA FUEL OIL STUDY TEAM

Richard Joswick (Study Leader; Managing Director, Global Oil Group) develops PIRA's outlook for crude and products pricing, refinery margins, and inter-regional supply balances. He authors the monthly *European Oil Market Forecast* and numerous special projects. Over the last few years he was the study leader for the successful multi-client studies: *Bottom of the Barrel: The Future for Residual Fuel Oil* (2007); *Heart of the Barrel: The Future for Middle Distillate Fuels* (2009); and *Top of the Barrel: The Future for Gasoline, Naphtha, and LPG* (2011). He joined PIRA in 2004 after 20 years with ExxonMobil in supply logistics, planning, refining, and engineering. During his time at ExxonMobil, he had assignments developing near-term oil market forecasts, designing heavy oil upgrading processes and evaluating refining economics. Rick has M.S. and B.S. degrees from Rutgers in chemical engineering.

Dr. Mark Schwartz (President) works closely with PIRA's Global Oil and Natural Gas groups to evaluate the key assumptions underlying their outlooks and to develop plausible alternative assumptions and outcomes. Before joining PIRA in 2002, he was the Chief Economist of ExxonMobil Corp., where he was responsible for developing the company's long-range economic and energy outlook. During his 25 years at Exxon he also had assignments in Upstream Planning, Treasurers, and Corporate Planning functions. Mark holds a Ph.D. in economics from the University of Pennsylvania.

F.W.A. (Bill) Fuller (Sr. Director, International Oil) had over 30 years of energy forecasting and analytical experience with Exxon International before joining PIRA in 1997. He now oversees PIRA's analysis and forecasting of near-term industry oil balances, with particular emphasis on international supplies, and monitors events impacting PIRA's oil market view. Bill has a B.S. in chemical engineering from Cornell University.

Gary Greenstein (Director, Global Oil Group) joined PIRA following 38-year career with ExxonMobil, where he was involved in all aspects of the refining business, including planning, operations, engineering, and research. Gary has a B.Ch.E. from City College of New York, an M.S. in chemical engineering from New Jersey Institute of Technology, and an M.B.A. from Fairleigh Dickinson University.

Peter Jaquette (Director, Global Oil Group) is a key contributor to PIRA's Scenario Planning Service, and was the coordinator for PIRA's Planning For Tomorrow study. He joined PIRA in 2007 with more than 25 years of experience in corporate strategic planning and economic consulting, including 14 years with ARCO and nine years with Weyerhaeuser, where he was involved in evaluating cellulosic ethanol and other energy projects. Peter has a B.A. in economics from Swarthmore College and an M.A. in economics from Stanford University.

Kenneth M. Bogden (Director, Freight Markets) is responsible for PIRA's monthly Freight Market Outlook. Prior to joining PIRA in 2005, Ken worked for ExxonMobil for 27 years, primarily in its oil supply and trading and planning functions. He also served as Coordinator of Transportation Planning for Exxon International. Ken has a B.S. in chemical engineering from Lafayette College and an M.B.A. from Columbia University.

David A. Zinamon (Managing Director, Refining and Environmental Affairs) specializes in refined products, refinery operations, NGLs, alternative fuels and environmental matters, particularly as they affect petroleum product markets. Among other activities he is responsible for PIRA's World Refinery Database. Dave also authors PIRA's monthly NGL market report. Dave joined PIRA in 1984 after seven years of international energy consulting experience with Chem Systems. This followed several years of manufacturing, marketing and planning positions with Celanese Chemical, GAF Corp., and Airco. Dave has a B.Ch.E. from City College of New York and an M.B.A. from Rutgers University.

Dr. Naing Oo (Associate Director) joined PIRA's Global Oil Group in 1995. He focuses on quantitative and econometric analysis for forecasting oil demand and prices. He is also involved in analysis on crude and product balances and trade flows. Naing holds a Ph.D. in economics from the City University of New York.

Su Hyung Ryu (Associate Director) focuses on crude and product price forecasts. Ms. Ryu maintains and develops integrated oil demand and pricing models and information systems. Since joining PIRA in 1998, she has participated in numerous benchmarking and competitive analysis projects, crude and product marketing assessments, and asset valuations. Prior to joining PIRA, Su worked at Citibank Global Banking, where she analyzed and developed investment database applications. She holds M.S. in business computer information systems from Baruch College in New York.

ACCEPTANCE FORM

(Company Name) _____ wishes to subscribe to the multi-client study **BOTTOM OF THE BARREL: AN UPDATED OUTLOOK FOR RESIDUAL FUEL OIL.**

We understand and agree that the fees are as follows:

Status	PIRA Client	Ea. Add'l User	Non-Client*	Ea. Add'l User
Standard Fee	\$21,500	\$1,000	\$26,000	\$1,250
Buyers of PIRA's 2007 RFO Study	\$16,500	\$800	\$19,500	\$1,000

New York City-based companies, please add 8.375% sales tax; Long Island-based companies, please add 8.625% sales tax; all other New York State companies, please add the county-appropriate sales tax.

Name/Title: _____

Company: _____

Address: _____

Phone/Fax/e-mail: _____

Total Fee: _____

Signature: _____

PLEASE MAIL OR FAX TO: **PIRA Energy Group**
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New York, NY 10016-5989
Phone: (212) 686-6808; Fax: (212) 686-6628; sales@pira.com

Note: *Bottom of the Barrel: An Updated Outlook for Residual Fuel Oil* will contain no confidential technical information, to the best knowledge of PIRA. However, except for information that is or becomes available to the public in printed publication, or is already in the possession of subscriber or developed independently by subscriber, or is received by subscriber in good faith from a third party, any information in the study is for the sole and confidential use of the subscriber. Subscribers agree to use reasonable efforts to protect the confidential nature of the information supplied to them as part of this study.