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## Value Creation in Challenging Economic Times

### – A Path to Oil Downstream Leadership

#### Background

A value creation approach offers downstream oil and gas players a lever to **increase margins and cash flows** in the face of declining demand, increased regulation, and industry over-capacity. Value creation steps go beyond continuous improvement by systematizing a program of change and embedding a culture of process excellence and service delivery. This type of approach enables management to balance global, regional, and local decision-making while making strategic cost reductions and controlling operational risk.

With the help of *operational excellence as the first step*, value creation emphasizes simplicity, speed, focus, and discipline across all aspects of the downstream value chain, including:

- » *In supply and trading* by providing real-time data from an improved technology backbone to support commercial optimization
- » *In the plant* by addressing execution effectiveness from the organizational and functional perspectives to deliver benefits from increased asset and labor utilization, particularly for complex turnarounds
- » *In sourcing and procurement* by streamlining and standardizing transactional processes, leveraging consolidated buys and increasing supplier collaboration to increase procurement ROI to par with global benchmarks

Successful programs align processes and systems with incentives, policies, communication, and training to create a culture focused on value creation. The Navigant approach highlights several critical success factors for implementing value creation in downstream:

- » A focus on programmatic change or targeted interventions in order to address the root cause of shortfalls
- » Visibly aligned leadership providing a clear direction for the program or intervention
- » Centralized program governance, planning, and management that works across silos and tracks progress against clear enterprise-level financial, strategic, and operational Key performance Indicators( KPIs)
- » Change management, ensuring consistent leadership alignment, and robust training to ensure capability exists at all levels to execute new processes and policies; this includes involving union leadership in change efforts
- » Organizational policies and incentives that align employee behaviors to target outcomes around cost management and cash generation

## Benefits of Value Creation

With current market externalities as a common backdrop, efficiency is driven by operational excellence becoming the prominent value level, as downstream is pressured to offer even lower cost products and services in emerging economies. Downstream players must access growth markets, but the average consumer in these geographies will not spend as much on vehicles or fuel as consumers in mature markets. Margins will be challenged globally, not just from price-sensitive new customers but also via increasing price volatility, higher threshold crude and base oil prices, and resulting lower refining margins. Even under the best case crude (and base oil) price scenario, downstream operations will be forced to take costs out of their business just to stay even with prior years' performance.

Based on Navigant's experience as well as multiple industry cases, the potential for value creation combined with operational excellence is multiplicative. It can deliver significant financial benefits, as well as non-financial benefits in safety, environmental, and compliance. It is common to see \$ 2-\$3/bbl in overall savings.

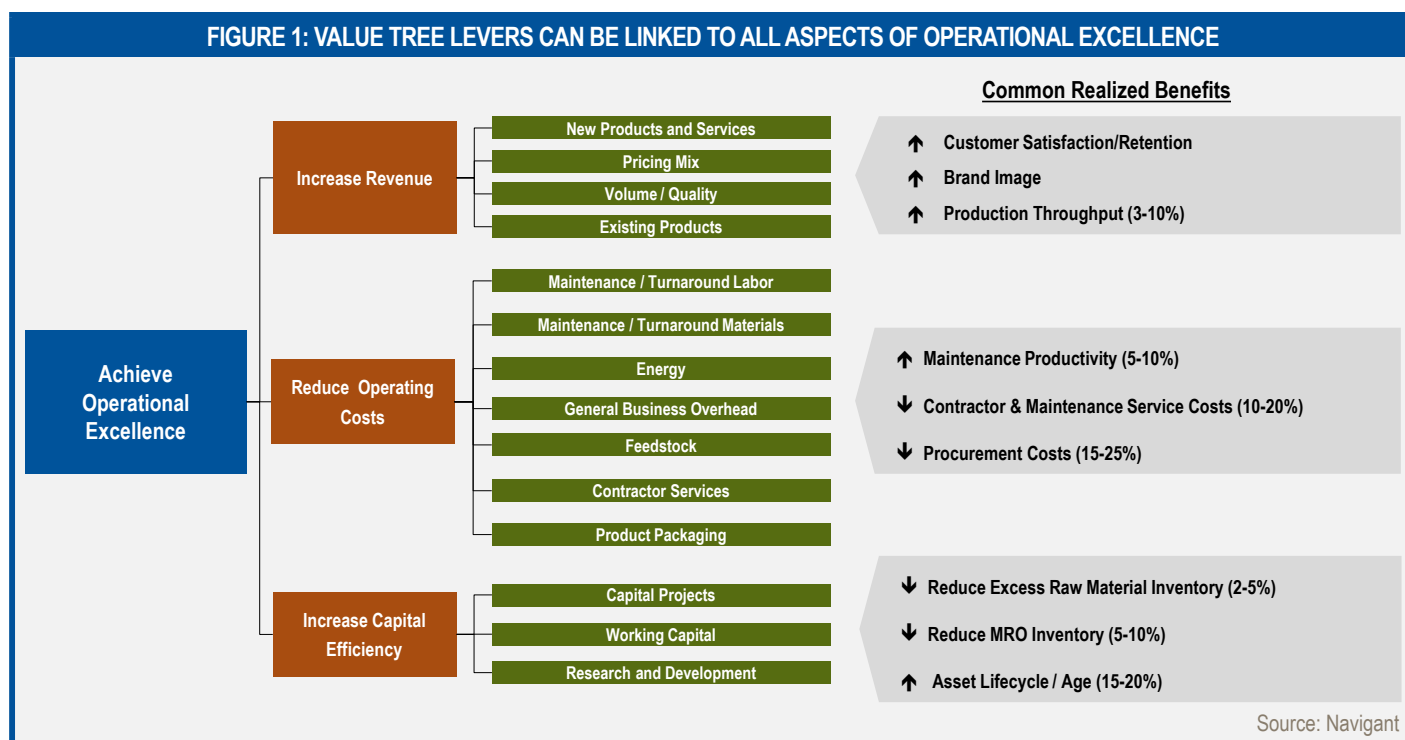
## Operational Excellence = the First Step

In order to achieve operational excellence, downstream companies must apply a comprehensive opportunity assessment methodology integrating people, process, and technology initiatives to drive step change in operational performance with a measurable value.

There are many barriers impacting the performance of downstream companies today. Simple and obvious individual and incremental improvements have been made over time; however, there is now a need to move to more holistic programs covering transformational cross-business needs. Lack of clarity on how to compare cost and process performance across sites and functions, along with a lack of understanding of root causes, affects moving the bar on overall performance.

Improved operational excellence is propelled by a set of discrete drivers to increase revenue, reduce operating costs, and increase capital efficiency and is best described using a value tree (Figure 1):

Efforts to **identify areas for improvement** involving these **drivers can be standalone or triggered** by other corporate-level activities such as updated work process standards.



Identification and capture of these opportunities is not always straightforward; more often than not, simple and obvious individual improvements have already been identified and implemented. Achieving operational excellence now requires moving toward more holistic and transformational programs covering cross-business needs. The need for this type of approach also reflects the need to pragmatically address the major components of operational excellence (Figure 2).

Organizations looking to achieve operational excellence would start by developing clarity on how to compare cost and process performance across sites and functions, both within their own network and relative to industry benchmarks. They will also need to understand root causes and systemic barriers driving cost and affecting overall performance.

A first step toward achieving these requirements is to follow a comprehensive opportunity assessment using a Kaizen-based approach over a 4- to 6-week timeframe (Figure 3). The results will:

- » Address all major operational excellence components across all organizational and functional areas—i.e., operations, mechanical, technical/engineering, and commercial
- » Reflect practices based on proven peer processes
- » Leverage like-to-like unit or site comparisons
- » Incorporate people, process, and technology (digital) changes
- » Utilize outside industry benchmarks and experience to focus detailed assessments
- » Identify implementation cost and change management requirements

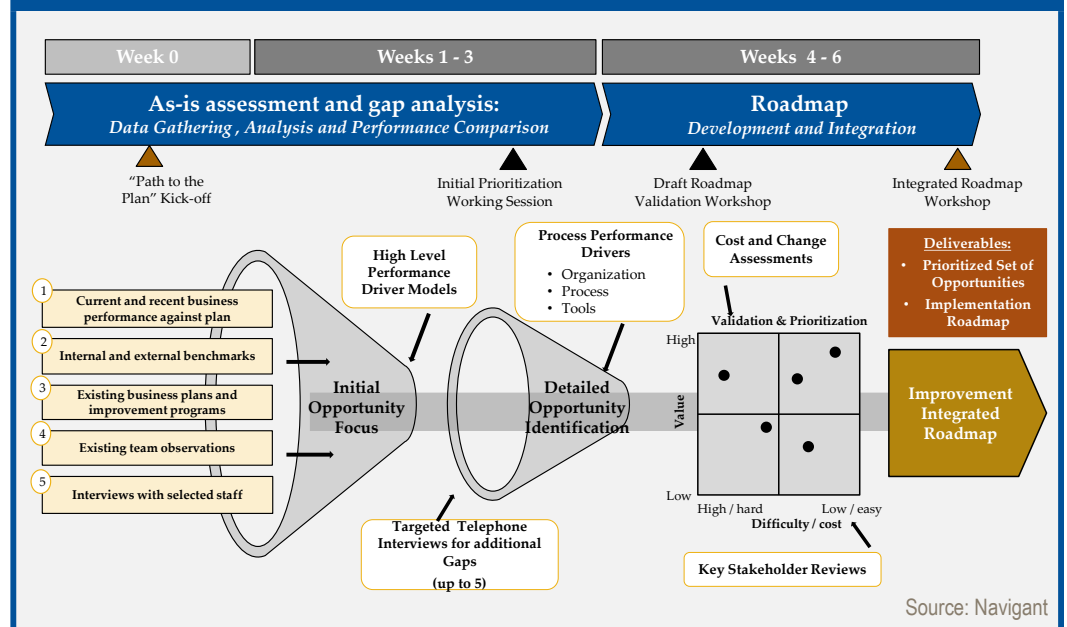
This approach identifies concrete areas for improvement that free up time for top-line improvements/optimization projects and drive auditable bottom-line improvements/cost efficiencies. Each of these improvement areas should be doable. To that effect, they need to

FIGURE 2: KEY COMPONENTS OF OPERATIONAL EXCELLENCE



Source: Navigant

FIGURE 3: OVERALL OPERATIONAL EXCELLENCE OPPORTUNITY ASSESSMENT APPROACH



Source: Navigant

first be validated with management and operations. The validation should be accompanied with tactical implementation plans that meet asset/site objectives, and it should insure that the improvements are in line with the company’s long-term operational strategies.

As mentioned previously, results of the assessments often indicate that systemic and infrastructure issues are driving higher cost and affecting overall performance. As a result, a disciplined implementation approach is required for achieving sustainable improvement. Sometimes these implementation plans are too large and cumbersome:

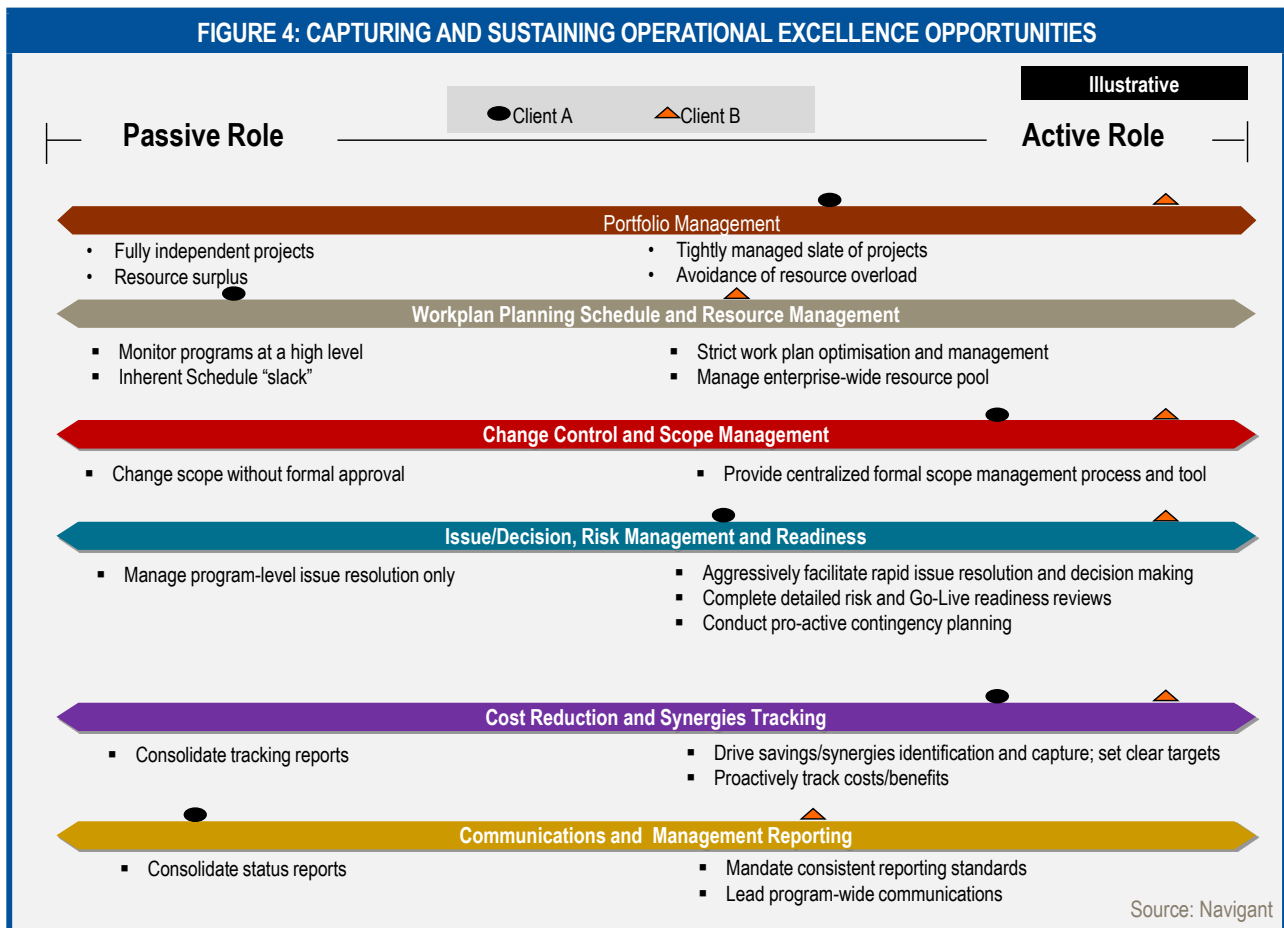
- » Full implementation and delivery of improvement plans often prove to be difficult, negatively impacting complete realization of benefits and, most importantly, lack of sustainability
- » Implementation of identified areas for improvement as individual initiatives does not address the systemic nature of the factors driving higher cost and affecting overall performance

Thus, in order to effectively capture the identified benefits in a sustainable manner, organizations should execute initiatives developed around all areas for improvement as a program, giving the necessary attention to change management and project portfolio requirements.

A project management office (PMO) approach that combines dedicated change management, portfolio management, and benefits tracking teams (Figure 4) is proven to be the most effective way to capture and sustain improvements to operational excellence across oil refineries and chemical plants.

Such an approach ensures the following:

- » Full implementation of all areas for improvement
- » Clear stewardship of all savings
- » Sustainable results
- » Knowledge transfer to site employees not directly involved in the opportunity assessment study
- » Full documentation of implementation approach so it can be reused/repeated at other sites within the company’s network



Downstream companies seeking to capture value by improving operational excellence would be well served to apply a comprehensive opportunity assessment approach to their operations. Being able to identify concrete areas for improvement and fully capture their value in a sustainable manner is the key to improved productivity of their working capital and assets.

## Value Creation in Supply and Trading

**Commercial optimization**—defined as advanced integration of all functions from feedstock supply and trading to marketing and sales—continues to be an important differentiator in downstream energy. As companies move to more highly integrated asset portfolios and facilities, commercial optimization is viewed as the mechanism to monetize and extract value from the end-to-end supply chain. Commercial optimization is also the necessary hedge and response to increasing global pressures on downstream margins. In emerging economies price controls and onerous tax schemes (i.e., high export taxes), as well as the propensity for governments to intervene to meet national interests (e.g., market interventions to maintain high refinery utilization and low prices despite low margin environments), put increasing pressure on margins and value delivery. In mature economies globalization and increased competition in both the local and global world commodity markets, as well as changing supply (refinery closures) and demand (i.e., increased demand for middle distillates) coupled with persistent regulatory challenges, place an increasing importance on the need to acquire the lowest cost feedstock and maximize margin for finished products. The global supply and demand balance is structurally changing with the closure of simple refineries, the shift from gasoline to diesel, and the impact of environmental regulations on demand. In response to these pressures, downstream operators must remain nimble to exploit short-term supply and demand balance shifts via commercial optimization and trading opportunities while also providing refineries with an optimized supply of crude oil for processing. Unexpected downtimes, changing weather patterns, political events, and even the Euro crisis (e.g., Spain going from a net importer to a net exporter) can drive material supply imbalances. As a consequence, the industry continues to make considerable investment in commercial optimization.

Specific tactical approaches to commercial optimization include:

- » Implementing and embedding sales and operational planning processes into the business strategy on a regional and global basis

- » Creating a centralized commercial optimization organization driven by role-based supply chain collaboration
- » Investing in Enterprise Resource Planning (ERP), supply chain, and trading systems integration to augment the integration journey with harmonized data and to allow automated data exchange between optimizers and their tools
- » Utilizing analytics capabilities to harmonize targets and performance tracking across the fuels value chain

Together, these approaches provide downstream operators needed information to convert long-term and turn short-term volatility into a profitable opportunity—not just through trading but through refining operations and marketing. With global supply in disruption, advanced tools and data integration can drive even higher value integration benefits via trading opportunities and by identifying privileged access to the supply required by portfolio refineries. Value drivers mirror the integration of a company's specific portfolio. First, along the value chain (i.e., Global Trading > Refining and Blending > Distribution) companies are building an integrated perspective that improves visibility and the reaction time cycle. As a result, companies are turning their eyes to sophisticated optimization and advanced analytical and prediction/simulation tools. This provides high performers with an integrated perspective along the different segments of the value chain and improved visibility and reaction time to optimize and respond to deviations or market events.

Based on Navigant's industry experts' experience implementing commercial optimization systems for International Oil Companies (IOCs) and National Oil Companies (NOCs), the experience shows that these facilitate adoption of advanced integration concepts. For example, several European and Middle Eastern NOCs have moved to a value-driven business steering model focused on optimizing integrated margins. Scorecards and KPIs reflect the impact of decisions on margins at the fuels value chain level. Integrated plans are now centrally managed for production, supplies, sales, and logistics. Commercial integration and optimization in this model can rely on up-to-date data, yielding better and quicker planning. Plan versus actual execution is tracked with mass balancing and yield accounting systems. Recent implementations enabled companies to operate according to rolling production and distribution plans that are continuously optimized and integrate short- and mid-term planning and scheduling. This can change the impact of increasing market volatility from threat to value generation opportunity.

For commercial optimization, value creation is increasingly achieved via close collaboration and data integration along the value chain. Value drivers in sales, supply, and trading include:

- » Information systems that establish the base to collect more integration benefits and trading opportunities. The **easy-to-operate environment** with flexible and well-integrated systems enhances **agility to deal with high volatility** and pricing fluctuations between raw materials and finished products and provides the information base to trading.
- » Central sales and operational planning, which supports **optimization of the asset value** chain envelope from feedstock procurement to customer pricing in order to find the most beneficial optimization strategy.
- » Remote operation centers (ROCs) real-time and historical data allow for **real-time feedback loops** connected to continuously improve forecasting and planning, and to prove fulfilment of trading commitments.

From an end-to-end value chain perspective, integrated information for commercial optimization provides a single point of reference for key data across units, plants, and sites. In addition, it enables collaboration and information exchange between people (onsite/offsite or across the organization) and applications for enhanced planning. Commercial optimization allows supply and trading managers to balance trading opportunities with the constraints of refinery complexity and customer demand. In some cases, companies have invested in ROCs to enable real-time optimization and collaboration. These centers are enabled by a plant performance portal that provides an integrated optimization view. This can include consistent KPI and plant benchmarking across units and functions supporting management decisions and measuring implementation effectiveness. It also promotes cross-functional integrated analysis and transparency for synergies and value opportunities.

The value creation approach to commercial optimization requires attention to people, processes, and systems across functions and business units and a two- to three-year time horizon for successful implementation. In addition, changes must be pursued through a systematic program. Only building technology to provide the data required to respond to market shifts in real time would not deliver the value of optimization. An organizational approach focused on aligning capability and incentives with operational shifts to systems and processes can embed a culture that allows full value realization.

## Value Creation Inside the Plant

Achieving a downstream operating model that emphasizes cost reduction and cash generation requires execution effectiveness inside the refinery gate. While refining organizations can be resistant to change, they are also the most important to address in terms of materiality. High performing energy companies are investing in programs to **increase operational effectiveness** across their manufacturing supply chain. These investments can be stand-alone and/or triggered by other corporate-level activities, such as the implementation/upgrade of enterprise-wide information systems or updated work process standards. Even the best performers in the industry find that while simple and obvious individual execution improvements have been addressed, they lack clarity on how to compare cost and process performance across assets/sites—both within their own network and relative to readily available industry benchmarks—and how to address root causes and systemic barriers that serve to impede gains in performance.

Operational effectiveness is a key lever to increasing true structural cost advantages and improving margins over the long term. Navigant's work with other leading downstream companies reveals investment in key value drivers that can drive savings of \$1.0–\$1.5/bbl across the site categorized by process, maintenance, and technical engineering as follows:

- » Reduce losses related to planned/unplanned downtime (5%–8% utilization improvement)
- » Reduce maintenance/Maintenance, Repair, Operations (MRO) materials costs (10%–15% savings)
- » Increase capital efficiency (10%–15% savings)
- » Improve turnaround management effectiveness (20%–30% savings)
- » Increase workforce utilization and multi-skilling (2%–4% savings)

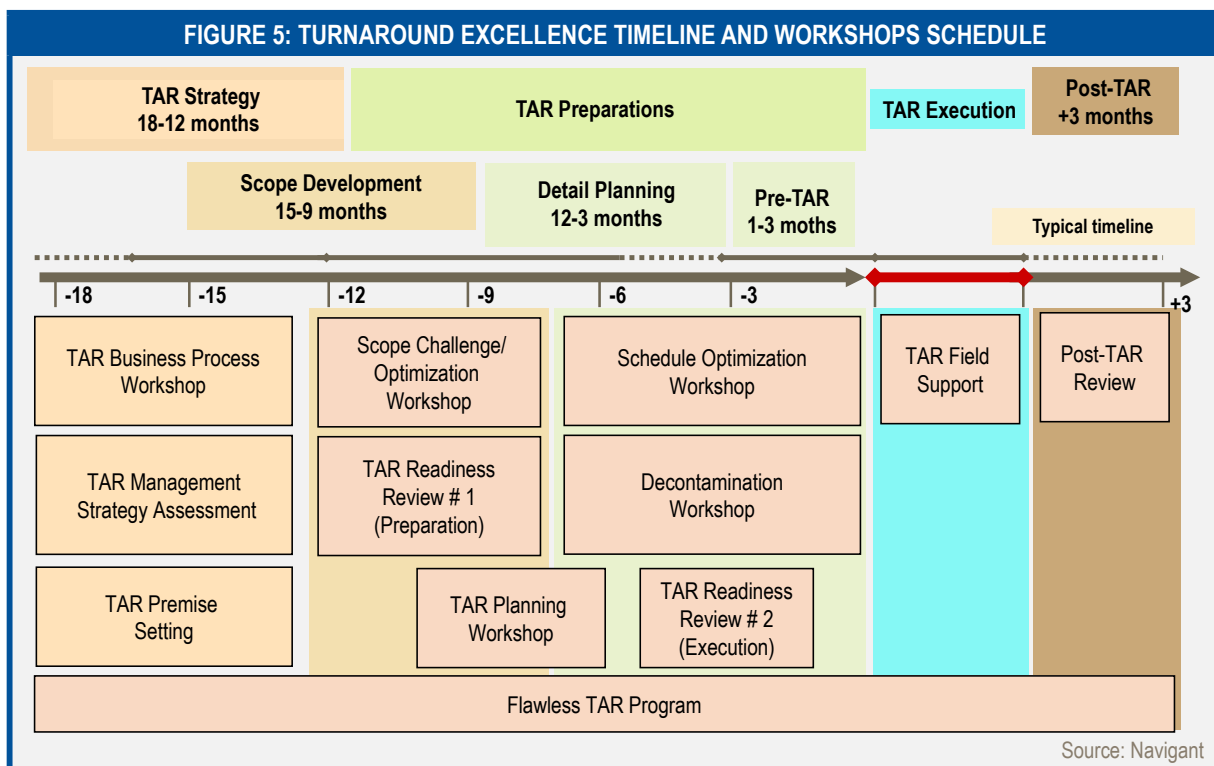
Perhaps the most impactful work Navigant has been involved with recently from a value creation perspective focused on addressing operational effectiveness challenges with a leading IOC. Specifically, they wanted to understand the differences between a top-tier refinery and a lagging target refinery. Navigant's approach was to address all operational effectiveness and asset management components—including process, mechanical, technical, and engineering in both organizational and functional areas—using a proven peer-to-peer comparison methodology. The work analyzed such elements as differences in terms of structure, processes, system

enablement, tools, and organizational structure. The like-for-like comparisons leveraged primary data collection, interviews, known industry benchmarks, and industry experience to focus detailed assessments. People, process, and technology changes were addressed, as well as cost and change management requirements, to determine level of difficulty. The results were profound: bottom-line improvements and cost and labor efficiencies were identified in the target refinery, which ultimately freed up time for top-line improvements and optimization projects. A doable set of opportunities were agreed by management and operations, including tactical implementation plans to meet site objectives and long-term operational strategies. The IOC is now in the second year of a four-year program to reduce costs and improve target refinery performance by \$1.50/bbl and move the lagging refinery to a higher quartile performance within a span of four years. Navigant has conducted similar and more extensive peer-to-peer exercises with great success in the upstream environment with IOCs.

Due to clear cost and risks considerations, **turnaround planning and execution is a key area of investment** to drive value in a value creation environment. A recent project Navigant supported in this area set out to determine critical success factors in the area of repeatable turnaround and maintenance management. Navigant’s work

with the client started with the initiation of a workshop of multi-disciplined participants to develop the turnaround business process model, with explicit benchmark measures, goals, and targets for improvement. Managing the turnaround process in a project-management style required **establishing a milestone plan for all preparation activities from 18 months pre-turnaround through the event and post-turnaround** and creating due dates and responsibilities for specific tasks and deliverables across 11 performance dimensions. Scope challenge/ optimization workshops were conducted 12 months prior to the major turnaround to methodically review scope, scheduling, risk, and associated costs for execution activities. The result was a quality turnaround playbook that set out detailed procedures for critical and non-critical path tasks/work packages, operational shifts, manpower, safety, and equipment covering the full cycle of pre-turnaround activities (e.g., scaffold erection, pre-fabrications, materials delivery, etc.), decommissioning and decontamination, maintenance, projects, inspection, commissioning, and post-turnaround works.

Again, the results were profound: the workshops facilitated internal alignment and common understanding of activities, performance metrics, resourcing, budgets, and scope of the turnaround into a single overview document. Streamlining of critical-path activities via lean



thinking—and partly from an appreciation of the value of a project control system together with investment in the skills for turnaround scheduling—reduced the turnaround time by four and a half days. **Better control of turnaround scope and scheduling saved 23% in cost.** Specifically, significant improvements were made with respect to external third parties in the areas of safety, reduction of re-works, and lower costs by using contractors more effectively in a range of contract types with an **overall savings of 15% on external spend alone.**

Navigant's work with clients in this area has revealed that, in an environment of execution effectiveness, improvement is a function of:

- » Organizational effectiveness—i.e., culture, roles and responsibilities, organization and processes, knowledge and capabilities, training and competencies, and communication
- » Functional effectiveness—i.e., health, safety, environment, operational excellence, utilization and reliability, and the maintenance process

Both competencies are equally important and, in Navigant's experience, some of the **lowest hanging fruit has been unleashed by addressing organizational effectiveness through streamlining the governance and/or organization model.** This includes upfront engagement with unions, where relevant, to build the consensus needed for targeted changes. In one example, one of Navigant's industry experts assisted an IOC analyzing total refinery FTE expenses by assessing where people were spending time, categorizing these activities by complexity and determining whether to eliminate, collocate, or even port activities and associated FTEs. With the advent of technology and access to highly skilled resources in regional business centers, some IOCs are considering a future model where even strategic engineering activities are done remotely. These kinds of improvements in workforce utilization can be extended within the plant to upskill employees across multiple processes or craft areas. Improving the availability of critical workforce skills can support improved top-line results through increased reliability and throughput.

## Value Creation in Centralized Sourcing and Procurement

One key area of investment for IOCs in their focus on downstream cost efficiency is the area of procurement. Leading companies have transformed their procurement and supply chain organizations significantly to improve the value delivered and to reduce cost. Traditionally the energy industry has lagged other industries in procurement return on investment (ROI). In the last decade, however, IOCs have invested heavily to improve procurement ROI—savings as a multiplier of procurement operating cost—which now ranges between 10 and 12 times in leading IOCs. Implementing value creation in sourcing and procurement focuses on eliminating silos, implementing centralized spend governance, driving efficient transactional processes, and creating a strategic procurement function to administer effective and standardized supplier collaboration and procurement operations.

The biggest changes in downstream procurement have come from addressing major value drivers focused on discipline and simplification:

- » Discipline in managing sourcing and procurement across silos and business units through the creation of a strategic procurement function that:
  - › Provides consistent governance for procurement activities across the fuels value chain
  - › Improves alignment of contracts and spend to business needs
  - › Builds innovation into supplier relationships
  - › Creates standardization in products and services delivered by suppliers
  - › Reduces cost through consolidation of buy and volume discounts
  - › Reduces risk by creating a more common set of suppliers
- » Simplification of transactional procurement processes and systems to:
  - › Reduce procure to pay errors and increase process efficiency
  - › Improve payment terms and thus, cost of capital
  - › Provide access to enterprise-level procurement data for decision-making
  - › Insure compliance to contractual terms and conditions



A **shift in mindset to a focus on a more broad value chain approach to cost reduction** is consistent with the value creation focus, eliminating silos and operating collaboratively across different functions as opposed to traditional approaches to cost-focused procurement, which is showing decreasing marginal returns. The value creation approach forces focus their effort on delivering improvements in such a way that all life-cycle costs linked to a material or service are reviewed and discussed. This is the concept of total value of ownership (TVO) and is allowing companies to unlock the next level of cost reduction, including addressing the more structural and indirect operational costs. While TVO is the focus, companies are also seeking more control of their overall spend while raising their game with respect to quality and safety through standardization and commonality. These activities have led to increased savings and value add.

The first step in the implementing value creation in procurement is to have clear-cut, tightly integrated strategies that seek to facilitate and drive business outcomes beyond just cost reduction from procurement. Procurement should be proactively brought to the table as a value creation partner and given the mandate to drive value alongside the business. This manifests itself in the form of **cross-functional and multi-disciplinary spend governance** to consider all angles of the cost build-up of items procured. This multi-disciplinary approach aligns all stakeholders and ensures **contracts are in place to cover a maximum of spend (leaders go up to 95% coverage)**, while also ensuring a high compliance by the internal customers when calling off materials and services. As a result, sourcing and procurement is increasingly better aligned with internal demand patterns and supply markets, ensuring full exploitation of synergies within the business; the resulting procurement operating model and organization reflect this customer and market alignment.

Driving efficiency in procurement operations—known as procure-to-pay—is achieved by investing in process and technology integration to handle more of the overall transaction burden. It should be noted that procure-to-pay targets value from categories with low price volatility. This differentiates procure-to-pay from commercial optimization, which delivers value from volatility in commodity prices. Leading IOCs operate **no-touch P2P processes for 90%** of their transactional volumes. This drives both cost and process efficiencies and improved spend visibility. Procurement spend coverage is a key driver to reduce maverick spend in the business and improve business collaboration. Benchmarks for value creation in procurement show successful companies **actively manage more**

**than 95% of total spend.** Managed spend can vary across geographies and business segments with businesses managing large chunks of spend on their own. Detailed understanding of who is buying what from which supplier is the first key step to better managing spend—both internally and externally. While delivering benefits from sourcing savings are important, it is equally important that there is no value leakage as contracts are executed. Managing supplier performance against contracts and compliance to contracted terms and conditions are to deliver industry leading 95% compliance to contracts.

Creation of a strategic procurement function can provide an efficient, standardized approach to non-strategic procurement activities, such as contract administration (including support and enablement of strategic sourcing agreements), tactical and spot sourcing, supplier onboarding, master data management, and reporting. Strategic procurement functions' results include increased contract compliance, improved customer experience, and cost reduction. Many IOCs have targeted **external collaboration with suppliers** and internal collaboration with the business (e.g., master data, SKU rationalization, buying lists, etc.), leading to significant advances in standardization of specifications in materials and services, which, in turn, have delivered improvements in safety and quality from common operating procedures. At the same time, ERP rollouts and the increased leveraging of shared services have also led to significant benefits in cost and flexibility from process standardization.

While the value from improved collaboration with suppliers has long been recognized, historically it has been practiced only sporadically because of a traditional arm's length buyer-seller relationship. **Today supplier collaboration has become a key imperative—not a choice. IOC peers recognize that cost-down tactics look unsophisticated and harm many supplier relationships.** It is important to collaborate with suppliers to optimize value through cost reduction, innovation, risk mitigation, and growth throughout the relationship life-cycle. IOCs have realized the importance of fewer suppliers with stronger relationships. A leading procurement organization has 80% of spend concentrated on 300-odd suppliers. An increased number of suppliers can negatively impact quality and safety: correlations between the number of suppliers and safety incidents are now well-understood in an industry where majority of the incidents emanate from third parties. A lower number of suppliers and increased collaboration with those that remain can improve safety and quality while also delivering better value for the business.

**Value creation principles are increasingly used to drive down operating cost through standardization and better leveraging of shared services.** Standardization and leveraging of shared services are not new concepts. However, achieving value creation in these areas has been a target for most IOCs. Procurement as function has been at the forefront of one way of doing things in addition to transactional execution from shared services. IOC leaders have transitioned all back-office and key strategic procurement activities to shared services, leaving only lean customer-focused site teams. Shared services are now important cogs in the procurement wheel of delivery—not only do they provide effectiveness, standardization, and efficiency but also flexibility in a world when the downstream business is moving East.

## Conclusions

Value creation is critical to capturing significant value by improving overall effectiveness and asset management capabilities in the context of a downstream transformation. Improved effectiveness generally results in the following:

- » Reduction of losses related to planned/unplanned downtime and sub-optimization of assets
- » Increased efficiency and effectiveness in maintenance, production, and workforce utilization
- » Reduced MRO materials costs
- » Increased capital efficiency

Identification and capture of these opportunities requires moving toward more holistic and transformational programs covering cross-business levers such as an integrated supply chains for commercial optimization, lean manufacturing cost structures (i.e., reduced expenditures in maintenance, projects, and turnarounds), and value capture through strategic sourcing/category management. Downstream companies seeking to drive higher margins would be well-served to apply the aforementioned levers to improve the productivity of their working capital and assets.

## How Can Navigant Help?

Using its in-depth industry knowledge and experience, Navigant's Oil and Gas consulting practice specializes in helping clients understand the issues, develop solutions, and execute on their strategy. Our team has deep experience in helping to drive value in highly volatile times, through upstream, midstream, and downstream operations.

— *Walter Pesenti, John Agoston and Nick Allen*

### About the Author »

Walter Pesenti – Managing Director with Global Energy Practice based in Los Angeles. He leads the downstream segment of the Oil and Gas practice across the Americas and Canada.

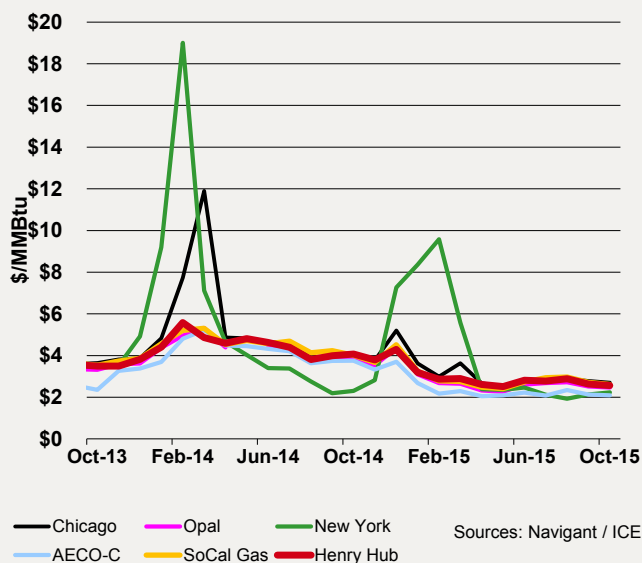
John Agoston – Director with Strategy and Operations based in Houston. He leads the Operational Excellence segment across the Americas and Canada.

Nick Allen – Director with Global Energy practice based in London. He leads the downstream Oil and Gas segment across Europe, Africa, and the Middle East.

*The opinions expressed in these article are those of the authors and do not necessarily represent the views of Navigant Consulting, Inc.*

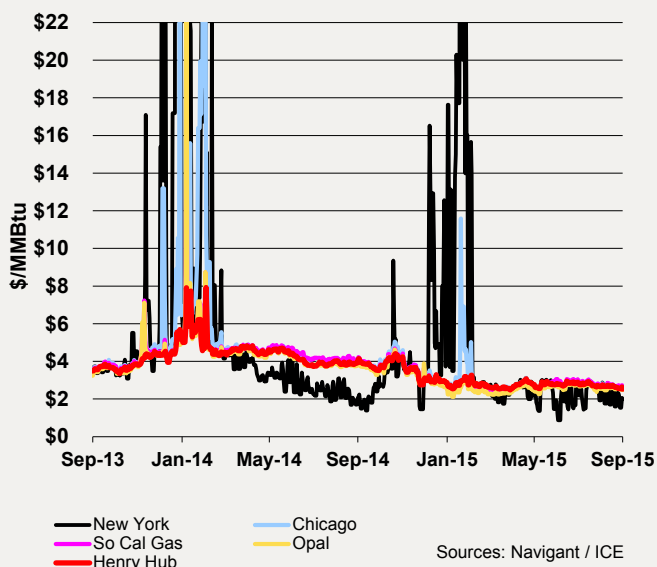
## Natural Gas Market Charts

### MONTHLY GAS INDEX PRICE



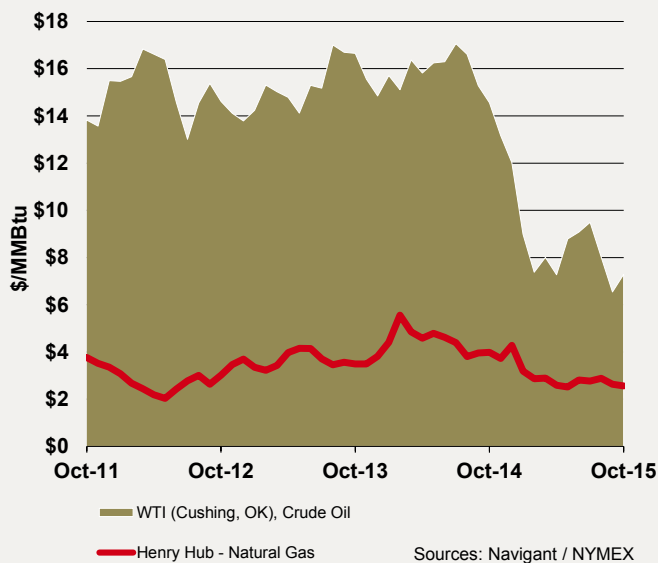
Monthly index gas prices decreased 3%, with Henry Hub at \$2.56/MMBtu for October versus \$2.64/MMBtu for September. The October 2015 price was below the October 2014 price of \$4.07/MMBtu by \$1.51/MMBtu.

### DAILY GAS PRICE



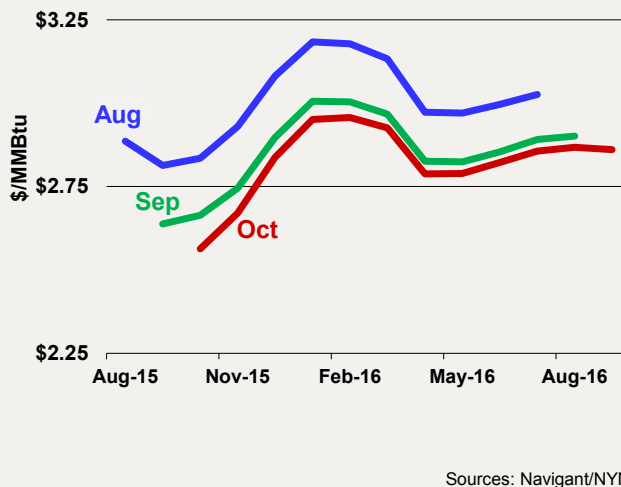
The daily spot prices ended September down 5% versus the end of August, with Henry Hub at \$2.53/MMBtu versus \$2.66/MMBtu.

### MONTHLY PRICES: OIL AND NATURAL GAS GULF COAST



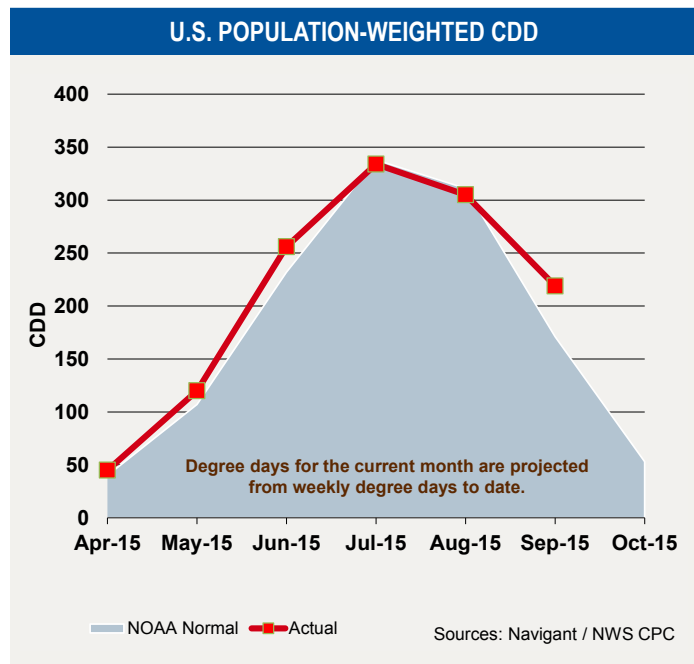
The most recent gas/oil price ratio increased to 2.8 times, with Henry Hub natural gas price at \$2.56 versus WTI crude oil price at \$7.29. The ratio one year prior was 3.7 times.

### NYMEX FUTURES SETTLEMENT PRICES AT CLOSE

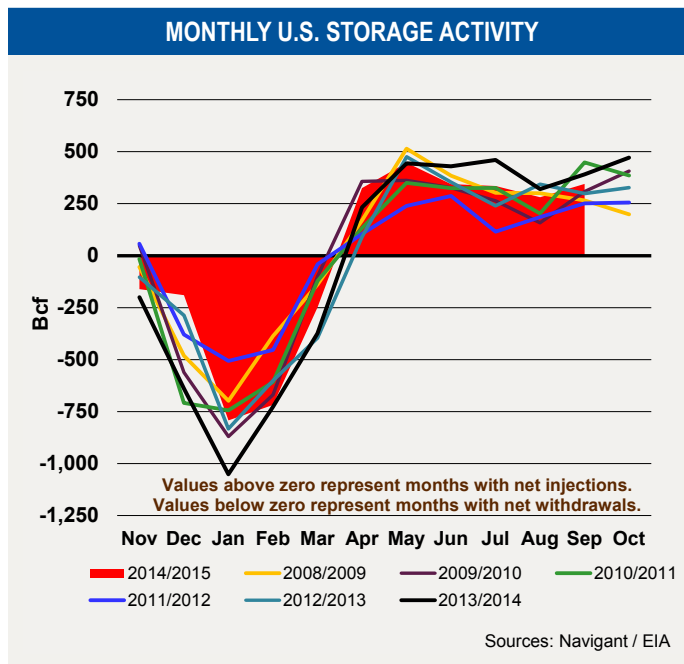


The average 12-month strip price was down 1% at \$2.82/MMBtu for the strip starting October 2015, versus \$2.85/MMBtu for the September strip.

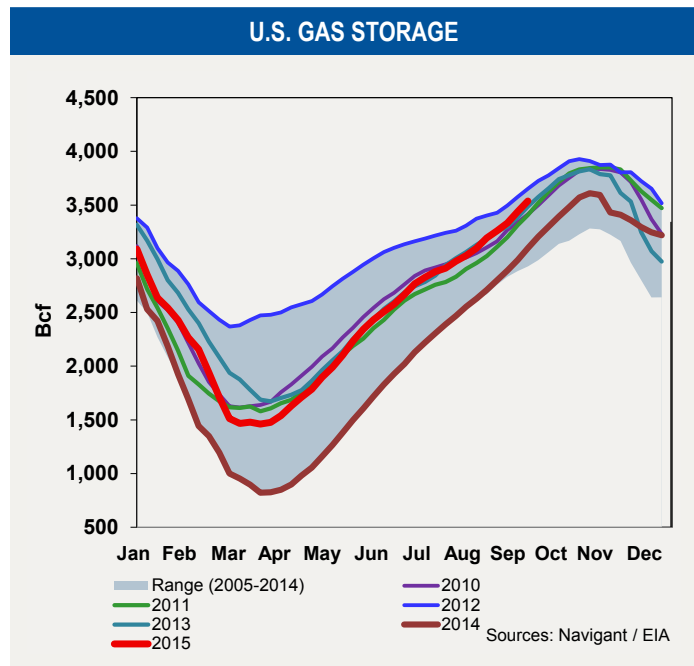
## Natural Gas Market Charts



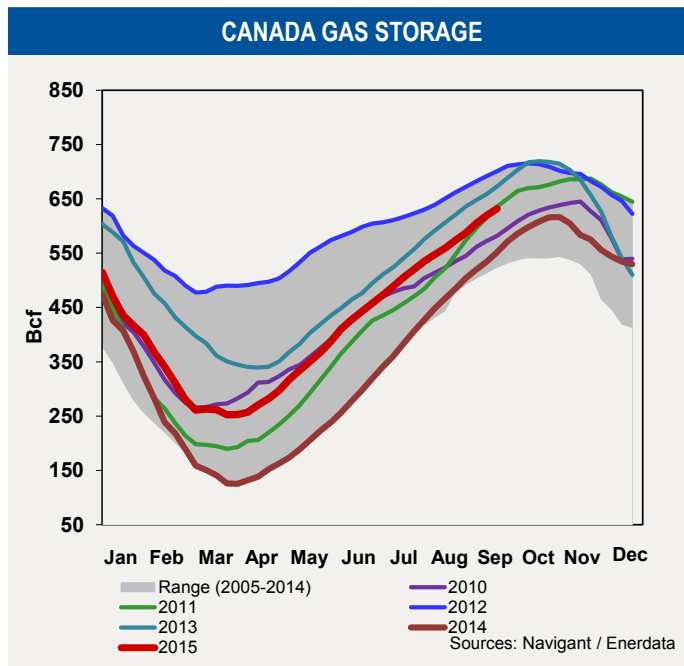
Warm weather in September brought seasonal cooling degree days up to 7% above normal.



Above normal U.S. storage injections continued in September, at 345 Bcf versus 324 Bcf, greater than seven of the prior ten years at this time.



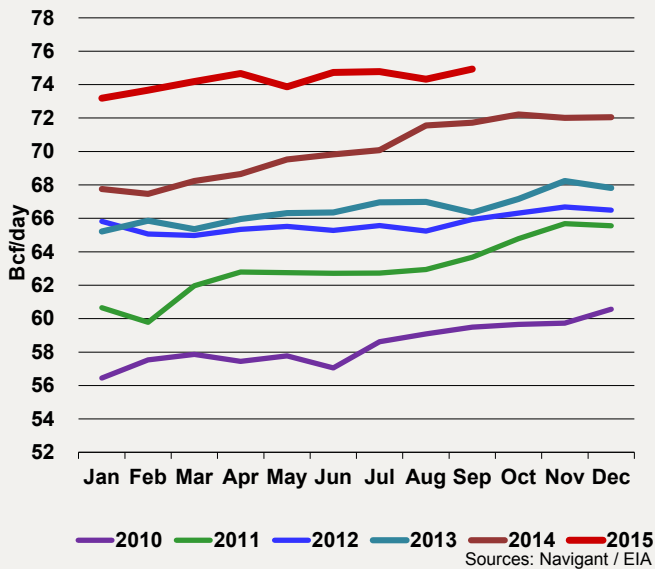
U.S. storage inventories increased in September to 3,538 Bcf, 6% above the average of the prior ten years at this time.



Canadian storage inventories increased in September to 632 Bcf, about 7% above the 590 Bcf average for the last ten years at this time.

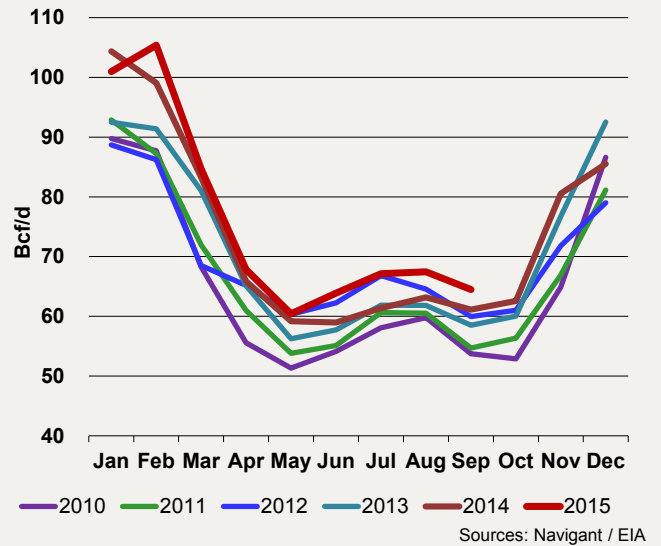
## Natural Gas Market Charts

### U.S. DRY GAS PRODUCTION



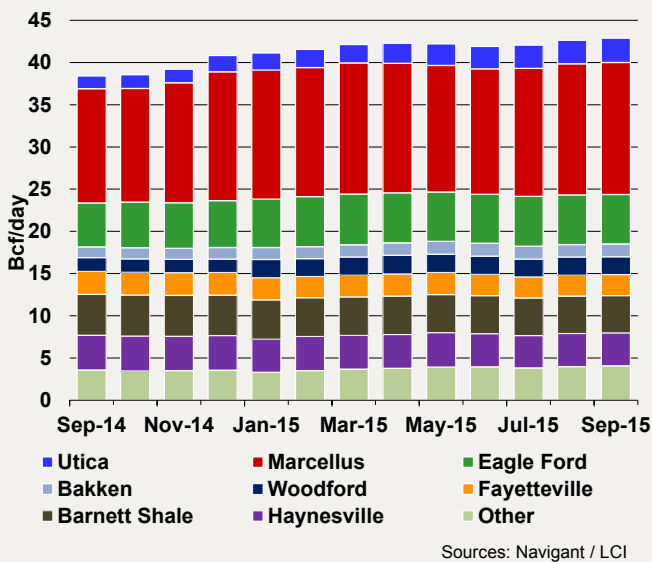
U.S. dry gas production reached an all-time high of just under 75 Bcf/d.

### U.S. MONTHLY NATURAL GAS DEMAND



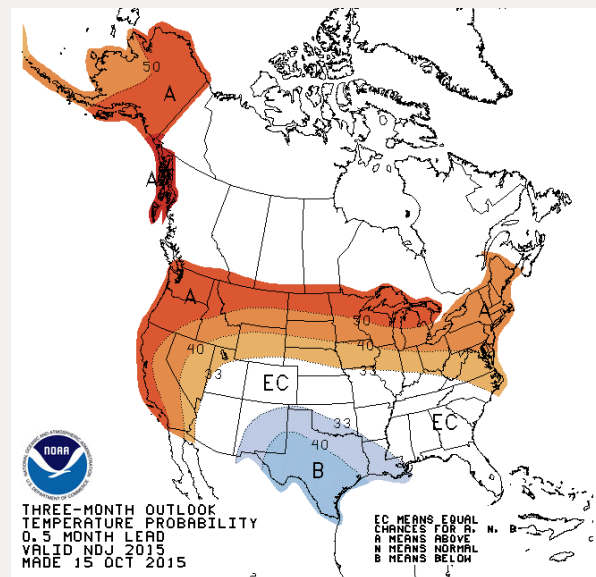
U.S. gas demand continued strong at all-time high levels for this time, with demand for the month of September at 64.5 Bcf, versus the prior high for the month in 2014 at 61.1 Bcf.

### U.S. WELLHEAD SHALE GAS PRODUCTION



U.S. shale gas production continued strong with its third straight month of increase, at an all-time high of 42.9 Bcf/d.

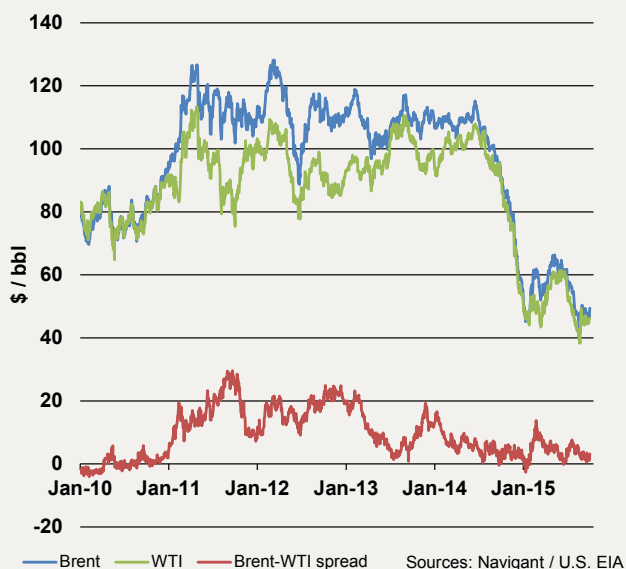
### U.S. TEMPERATURE OUTLOOK



The temperature outlook is for above normal temperatures west of the Rockies, and across the northern and central U.S. through the Midwest to the Northeast and Mid-Atlantic. Below normal temperatures are favored for New Mexico, Texas and Louisiana.

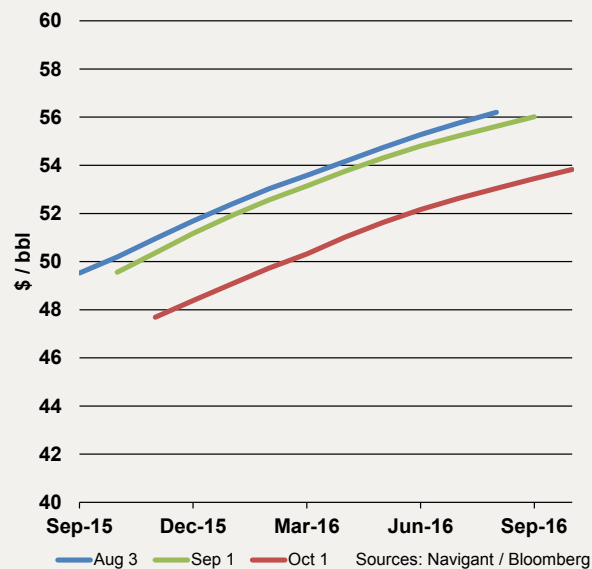
## Oil Market Charts

### SPOT CRUDE PRICES



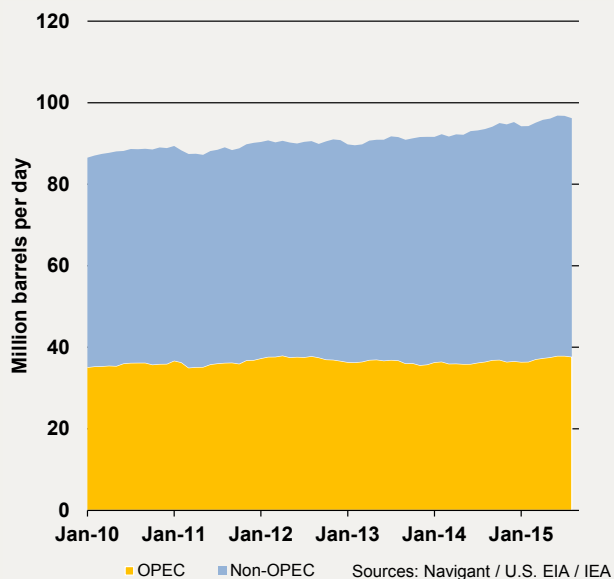
After three years of relative stability in the \$90-110/bbl range, crude prices plunged 60% from June 2014 levels. Prices averaged \$48/bbl (Brent) and \$45/bbl (WTI) in September 2015.

### ICE BRENT FUTURES CURVE



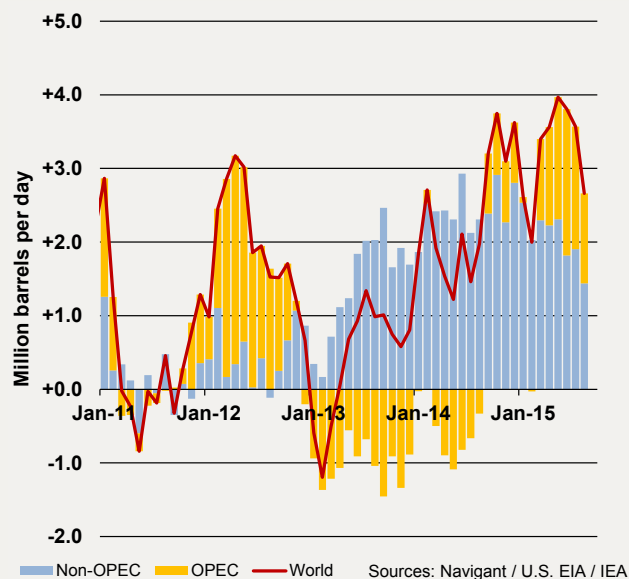
The average 12-month strip price at the beginning of October was \$51/bbl, a 4% fall from the previous month.

### OPEC & NON-OPEC OIL PRODUCTION



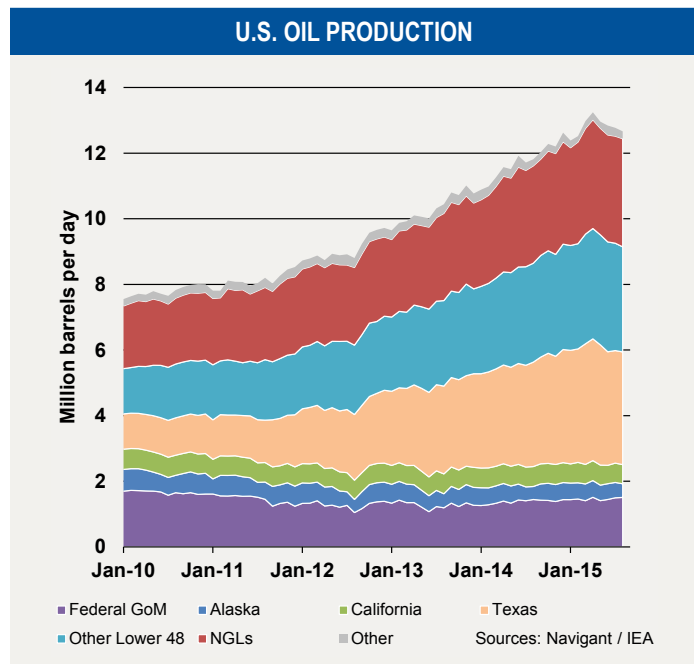
Global oil production increased from 93.5 million barrels per day a year ago to an estimated 96.2 million barrels per day in August 2015, of which 39% was supplied by OPEC.

### YEAR-ON-YEAR CHANGE IN OIL PRODUCTION

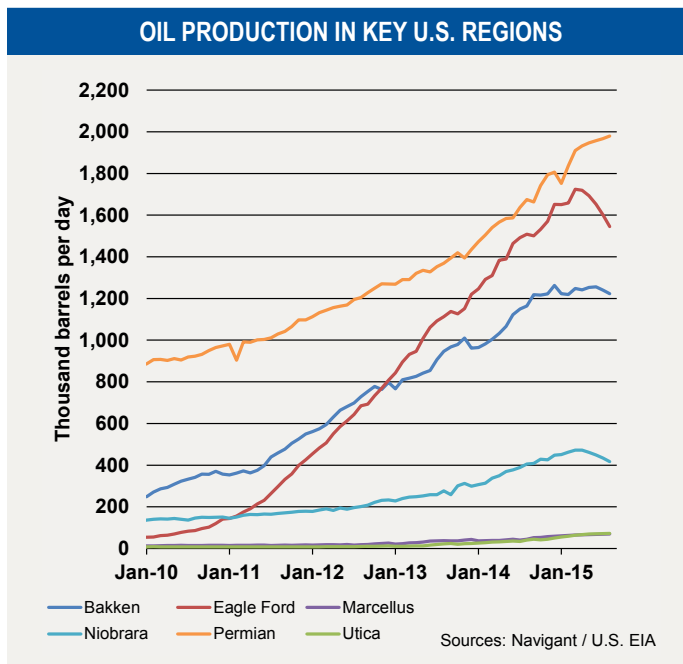


Oil production growth in recent years has been led by non-OPEC countries, particularly the U.S.

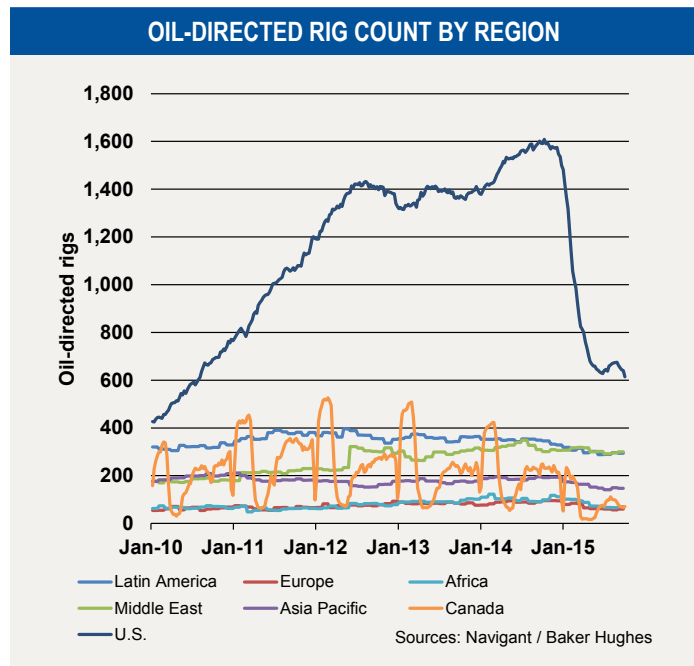
## Oil Market Charts



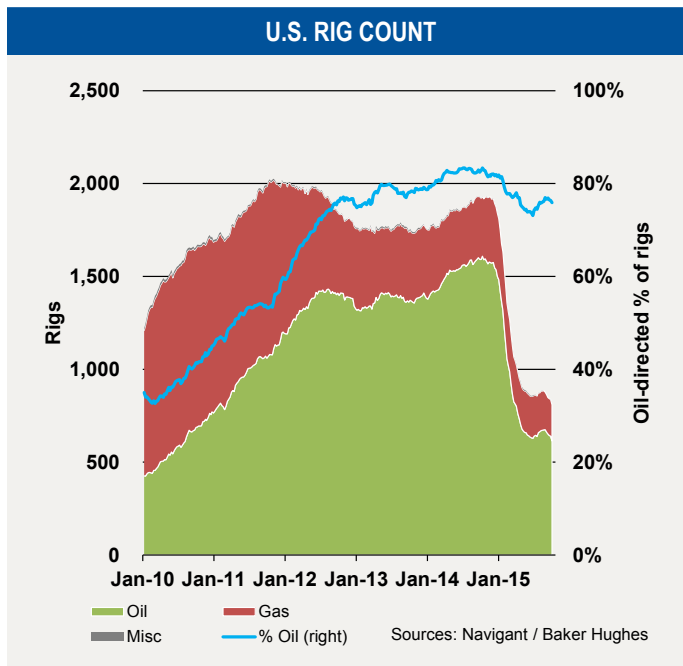
In the United States, oil production climbed by 7% over the year to an estimated 12.7 million barrels per day in August 2015. However, production has fallen since April.



In August 2015, oil production reached an estimated 1.98 million barrels per day in the Permian (+18% YoY) but production continued to dip in Eagle Ford, Bakken and Niobrara.



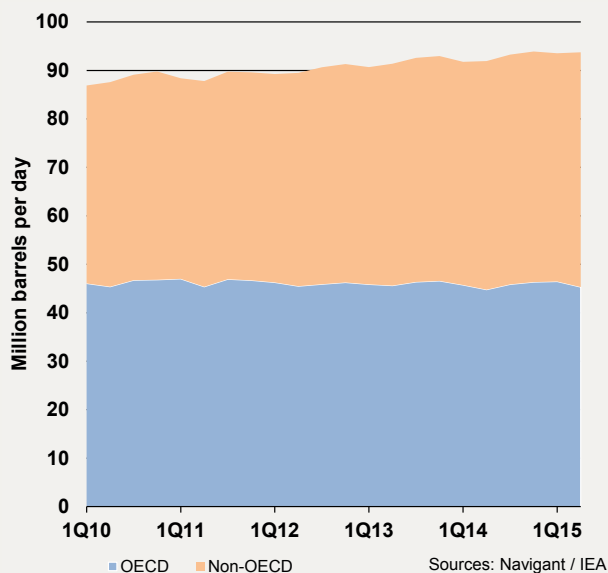
Rig counts have continued their decline in response to lower oil prices. The U.S. hit a fresh low of 614 oil rigs at the start of October, a level last seen in August 2010.



76% of U.S. rigs were oil-directed at the start of October.

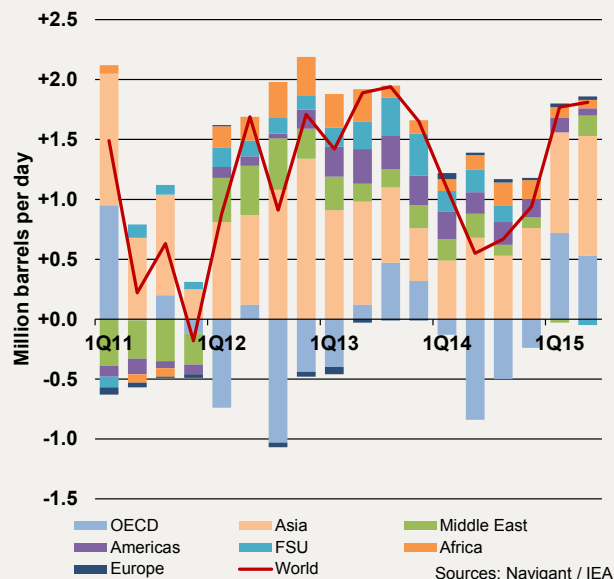
## Oil Market Charts

### OECD & NON-OECD OIL CONSUMPTION



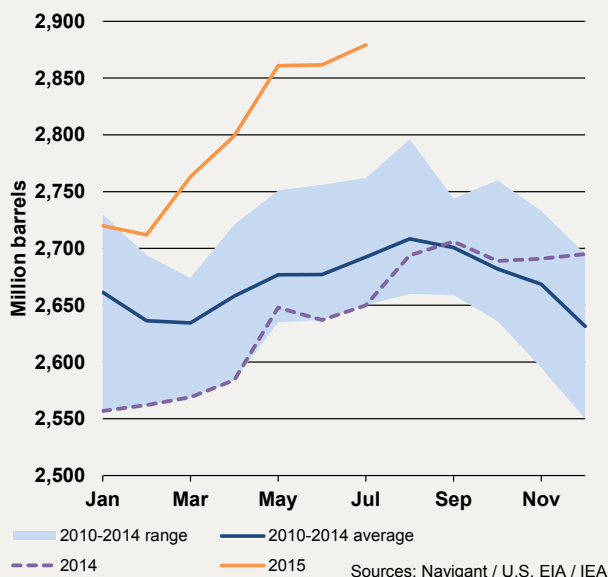
Global oil consumption increased from 91.9 million barrels per day in Q2 2014 to an estimated 93.8 million barrels per day in Q2 2015, of which 48% was consumed by OECD countries.

### YEAR-ON-YEAR CHANGE IN OIL CONSUMPTION



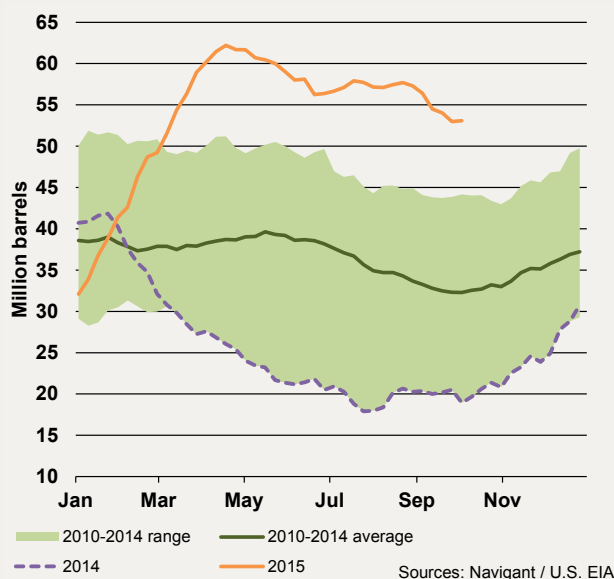
Oil demand growth in recent years has been led by non-OECD countries, particularly in Asia (e.g. China).

### OECD COMMERCIAL STOCKS OF CRUDE & PRODUCTS



OECD commercial inventories reached an estimated 2,880 million barrels of crude and products in July 2015, remaining 7% above the five-year average.

### CRUDE STOCKS AT CUSHING, OKLAHOMA

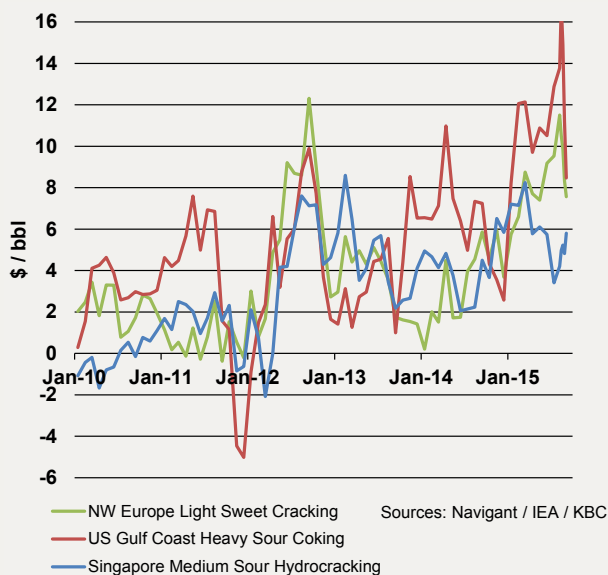


Crude inventories at the Cushing hub (the delivery point of the WTI contract) totaled 53.1 million barrels in early October, remaining 64% above the five-year average.



## Oil Market Charts

### INDICATIVE REFINING MARGINS



At the start of September 2015, indicative refining margins were \$7.57/bbl for NWE light sweet cracking, \$8.47/bbl for USGC heavy sour coking and \$5.80/bbl for Singapore medium sour hydrocracking.

### EU CARBON ALLOWANCE PRICES



EU carbon allowances have recovered to above €8/tonne since the lows of April 2013.

### U.S. ETHANOL RIN PRICES



U.S. ethanol RINs have more than halved in value since May when the EPA announced proposals to cut quotas.

### U.S. BIODIESEL RIN PRICES



U.S. biodiesel RIN prices have also collapsed because of falling soybean oil prices and rising biodiesel imports.

## Legislative and Regulatory Highlights



## Northeast

**PennEast Pipeline Submits Application to FERC**

On September 24, PennEast Pipeline Company applied to FERC for a certificate of public convenience and necessity to construct, own and operate its proposed 118-mile pipeline from eastern Marcellus supplies in northeast Pennsylvania to an interconnection with the Transco pipeline in New Jersey. The project has entered into binding precedent agreements for 990 MMcfd of its 1.1 Bcfd capacity with utilities and electric generators in New Jersey, Pennsylvania and New York. The project sponsors are AGL Resources, NJR Pipeline Company, PSEG Power, South Jersey Industries subsidiary SJI Midstream, Spectra Energy Partners, and UGI Energy Services. The application estimates an on-line date of November 2017.

**Columbia's East Side Expansion Project Place in Service**

On October 2, Columbia Pipeline Group announced that the East Side Expansion Project of subsidiary Columbia Gas Transmission was placed in service. The project adds 312 MMcfd of capacity to Columbia's system to serve demand in eastern Pennsylvania and New Jersey from Marcellus and Utica shale supplies to the west.

**Massachusetts Clears Way for Electric Distribution Companies to Contract for Pipeline Capacity**

On October 2, the Massachusetts Department of Public Utilities issued its Order Determining Department Authority Under G.L.C. 164, Section 94A, allowing potential rate recovery for electric distribution companies (EDC) that enter into long-term contracts for natural gas pipeline capacity to help serve their electric load more cheaply. The proceeding was initiated to investigate innovative solutions to bring more pipeline capacity into the area to benefit electric ratepayers, since the gas price impacts of natural gas capacity constraints are felt disproportionately in the deregulated power markets, where fuel transport has generally not been obtained on a firm basis. While the order finds that the DPU has the authority to review and grant approval to EDCs to enter into long-term pipeline capacity agreements, it does not appear to have determined the mechanism by which the capacity held by an EDC would be allocated or transferred to electric generators in order to obtain required fuel supplies.



## British Columbia

**NEB Approves LNG Export Applications by Steelhead LNG**

On October 1, the National Energy Board issued Letter Decisions approving the applications by Steelhead LNG for five projects in British Columbia to export natural gas in the form of LNG. The approvals for the five projects total 44.6 Tcf over the course of 25-year terms (average 4.88 Bcfd). The approved export points are in the vicinity of Sarita Bay, which is near the Trevor Channel, and near the village of Mill Bay. For each project approval, the NEB determined that the quantity of gas to be exported is surplus to Canadian needs, citing the Market Assessment and Export Impact Assessment prepared by Navigant Consulting for the Steelhead applications. The Navigant reports highlighted the ample, stable supplies for both the Canadian and North American gas markets, as well as the competitive and efficient nature of the interconnected North American gas market.

**Veresen Announces Progress on its Montney Area Gas Plant**

On October 6, Veresen Inc. announced that the Cutbank Ridge Partnership, its counterparty on a midstream fee-for-service arrangement, has sanctioned the \$860 million, 400 MMcfd Sunrise gas plant to be located near Dawson Creek in the Montney play region. Cutbank Ridge is a partnership between Encana Corporation and a Mitsubishi subsidiary, and entered into the agreement with Veresen Midstream LP (50% Veresen and 50% KKR) in 2014 for up to \$5 billion in midstream projects to serve its Montney assets.