



# Comment

News & Information for the Energy Industry

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1  
Winter 2011

## 5<sup>th</sup> International Operations Excellence Conference: February 29 & March 1, 2012 Houston

In October 2010, Ziff Energy hosted the 4<sup>th</sup> International Operations Excellence Seminar in Houston. The program was attended by over 100 Operations Executives and Managers from 24 countries on 5 continents. Attendees learned from 25+ industry leaders who shared their experiences and provided many illustrative examples and best practices. The 2-day seminar included many opportunities for attendees to network with speakers and other attending E&P participants. Speakers were carefully selected by Ziff Energy to represent companies that have achieved excellence and leadership in various types of oil and gas operations, including: onshore and offshore; primary, secondary, and enhanced recovery; and mature and young unconventional.

The 5<sup>th</sup> Operations Excellence Conference will be held on February 29/March 1, 2012 in Houston.

**Day 1** will cover industry wide issues, with an *Executive Perspectives* panel in the morning, and an afternoon focus on achieving new standards and the role of *Maintenance* in Operations Excellence.

### Session 1: Executive Perspectives on Excellence

- Glenn Schaaf, VP Drilling & Production - ConocoPhillips
- Invited: Encana, ENI, Talisman

### Session 2: Maintenance & Integrity Management

- Pat O'Quinn, Prod. Efficiency Improvement Team Leader - BP Azerbaijan
- Paul Kefford, Asset Integrity Manager - Chevron
- Michael Bast, Manager, Global Production Excellence - Hess
- Federico Caldora, VP Operations - Pan American
- Greg Washington, Upstream Prod. Perf. & Op. Excellence Lead - Shell
- Invited: ExxonMobil

**Day 2** will feature 2 tracks: Onshore Case Studies (Oil & Gas) – with a Focus on Unconventional Resources, or Offshore/Deepwater Case Studies.

### ONSHORE

#### Session 1: Unconventional/Shale Gas

- Apache
- Fernando Aguilar, President & COO - Calfrac
- Michael Chambers, VP Operations - Exco
- Darren Gee, President & CEO - Peyto

#### Session 2: Unconventional Oil

- Brian Matusek, VP Business Development - Cameron
- Rick Muncrief, SVP Operations - Continental

#### Session 3: Mature Oil/Gas & EOR

- Ecopetrol
- Lanny Schoeling, VP Eng. & Technical Development - Kinder Morgan CO<sub>2</sub>
- Luis Andres Rojas, SVP Production, Pacific Rubiales
- Dave Szabo, VP Reservoir Management & Reserves - TNK-BP

### OFFSHORE

#### Session 1: Deepwater Operations

- Darrell Holleck, VP, GOM Operations & Development, Anadarko
- Oladipo Oke, Deepwater Operations Manager - Chevron Nigeria
- Ken Hampshire, Manager, Azurite Field Development - Murphy Congo
- Petrobras
- Chris Smith, Perdido Operations Manager, Shell

#### Session 2: Shelf & "LNG Gas Feed" Operations

- Dr. Sheldon Plahn, Engineering Manager - Apache
- Adam Prince, Business Delivery Unit Manager - BG
- Ricardo Juiniti, General Operations Manager - OGX BRAZIL
- Kevin Hurst, Operations Manager, GOM Production - Stone Energy

To **register**, please contact Conference Coordinator, Jenny Jackson, at [jennifer.jackson@ziffenergy.com](mailto:jennifer.jackson@ziffenergy.com), 1-403-234-4297, or visit our website <http://www.ziffenergy.com/event/opex5.aspx>.

## 22 Participating Operators from 11 Countries\*



Join us at opex 5!

INSIDE:	
5 <sup>th</sup> Intl Operations Excellence Conference .....	1
1 <sup>st</sup> Canadian Gas Plant Infrastructure Study.....	2
Thermal Oil Sands Operations Study Launch .....	2
18 <sup>th</sup> IFP Study Indicates Surge in Cost of Oil Production .....	3
Ziff Energy in the North Sea .....	4
New Upstream Development Projects? .....	4
7 <sup>th</sup> Permian Basin Benchmarking Study Launched .....	5
8 <sup>th</sup> Gulf of Mexico Deepwater Study Completed.....	6
Assessing Operations Performance of N.A. Gas Plants .....	7
LNG Exports from Canada.....	8

\*as of November 22, 2011

## First Canadian Gas Plant Infrastructure Study


Guest Article: Bob Child, Principal, Gas Processing Management Inc.

Ziff Energy, working with Gas Processing Management Inc. (GPMi), has kicked off its first in a series of in-depth studies that will analyze the Gas Gathering and Processing Infrastructure in Western Canada. This study titled “**Northern Foothills** Infrastructure Repositioning for Montney Growth” will analyze the Gas and Liquids Infrastructure in the developing Montney trend of Northwest Alberta and Northeast British Columbia to present a ten-year blueprint for a step change in how the existing and additional required infrastructure is developed, managed, and operated. Significant new investment is forecast to be required to construct additional gathering, processing, and transportation infrastructure to handle new Montney Tight Gas production, as well as to reconfigure the conventional existing facilities to optimize their use with the growing gas production base. Industry can work cooperatively to develop new dedicated infrastructure and to utilize the area’s existing infrastructure for the benefit of both the developing and the current resource base. The study’s assessment of the total infrastructure required will potentially result in decreased capital investment, decreased per unit operating expenses for both the new and existing production, and increased recovery of the existing gas resource base.

Ziff Energy brings the Business and Resource Analysis expertise and GPMi the Infrastructure, Engineering, Commercial, and Process Experience; the two Consulting Firms have joined forces to bring the “Best of the Best” to analyze and develop strategic alternatives for investors, production owners,

and infrastructure operators. Currently the Montney Study is support by five major area producers and processors (AltaGas, Murphy Oil, Shell Canada, Suncor, and one confidential producer) and will be ready for distribution by Christmas 2011.

The second study in the series “**North Central Foothills** Infrastructure Repositioning for Tight Gas Growth (Kaybob)” will study the similar challenges in the Simonette, Kaybob, Edson, and Hanlan areas of North Central Alberta. This study has the increased complexity of rapidly developing sweet and low H<sub>2</sub>S Tight Gas Trends in an area with significantly underutilized large sour gas processing infrastructure, necessitating the development of strategic new gathering and processing facilities and the repositioning of the large sour facilities to effectively process the declining conventional sour gas production and, where appropriate, process the developing trends. This study is still in the marketing stage and currently supported by four large area producers and processors (Talisman Energy and three confidential parties). We anticipate the study will proceed this fall with distribution targeted for the end of Q1 2012.

The third in the infrastructure analysis series (**Caroline** area) will be initiated upon completion the North Central Foothills (Kaybob) Study. For more information, contact Bill Gwozd, P.Eng., Vice President, Gas Services at 403-234-4299 or bill.gwozd@ziffenergy.com. 

## Thermal Oil Sands Operations Study Launch - 1<sup>st</sup> Edition

Sergey Turchin, Manager, Operations Consulting Services & Paul Ziff, CEO

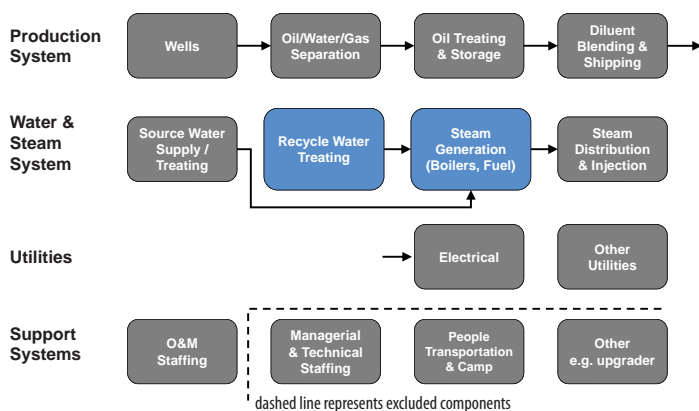
Production from in-situ projects will double in the next 10 years. To remain competitive, one needs to understand the drivers of operating performance and ways to enhance steam and production operations. It is not easy to identify which operating areas offer the greatest potential for meaningful savings, and whether field operations are performing with “best in class” reliability.

The Ziff Energy analysis will evaluate:

- COST** - comparing total unit operating costs amongst peer properties and providing in-depth analysis of field and plant operations by cost category. Our categories of key controllable costs address 3 main aspects of thermal operations: Steam Plant, Energy Use, and Field Operations. Sub-Classifications will reveal specific cost opportunity areas. We will pinpoint high cost areas and identify the savings potential for each.
- FIELD UPTIME** - assessing the production efficiency of individual fields, and identifying “leader” production reliability targets.
- STEAM PLANT RELIABILITY** – assessing the steam generation efficiency of individual facilities, and identifying improvement areas by cause of downtime.

This study has been designed with input from industry professionals, and so far we have 6 participating operators for the study. We plan to start the project in January with expectations to publish final client reports in late Q2 2012. For more information, contact Sergey Turchin at 403-234-4298 or sergey.turchin@ziffenergy.com. 

### Thermal Project Components



## 18<sup>th</sup> Edition “Improving Field Performance” Study Indicates Surge in Cost of Oil Production in Western Canada

Sergey Turchin, Manager, Operations Consulting Services

Ziff Energy’s 18<sup>th</sup> annual Improving Field Performance Study provides an independent third-party analysis of upstream production operations in the Western Canadian Sedimentary Basin (WCSB). The study benchmarked both the uptime reliability and detailed operating costs of 157 oil and gas fields and 15 gas plants from both E&P and midstream companies operating in the WCSB. These properties collectively produce 2.6 Bcf/d of gas and 90 MBOE/d of liquids from 20,429 wells and account for Total Adjusted Operating costs of \$1.6 billion per year (including the cost of consumed Lease Fuel and third-party processing).

The study found oil & gas field operating costs in Western Canadian Sedimentary Basin declined slightly (3%) in 2010. Marginal cost reductions were observed in Chemicals and Contract Services. The operating costs for Oil Assets posted a 17% cost increase in 2010, however, Gas Asset operating costs declined a modest 3%.

Oil and gas producers are still experiencing high processing fees and surface facility maintenance costs.

The 2010 ‘Big 4’ Gas Costs are:

- Processing Fees (22%); Surface Repairs & Maintenance (15%); Lease Fuel Used (14%); Labour (14%).


For Oil Fields the ‘Big 4’ costs are:

- Surface Repairs & Maintenance (18%), Purchased Energy (17%), Well Servicing (17%), Labour (13%).

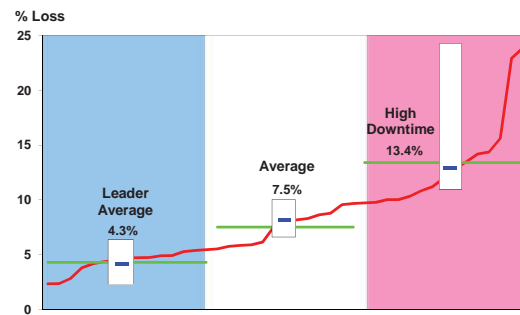
The graph below shows the makeup of average gas and oil costs in 2010. The results are presented in Canadian dollars.

### Production Reliability – Big Opportunity

Ziff Energy’s IFP study has included an assessment of oil and gas Production Reliability (‘Uptime’) metrics for the last 4 years. Ziff Energy developed a unique methodology to evaluate Production Efficiency, Mean Time Between Incidents (MTBI), Mean Time To Recover (MTTR), and a proprietary Reliability Index. This methodology compares similar operations of different operators and quantifies production improvement opportunities. This year’s study results revealed improved year over year production efficiency improvement for several clients. Overall, however, *significant opportunities remain* for operators to improve uptime performance, increasing production volumes and cash flow.

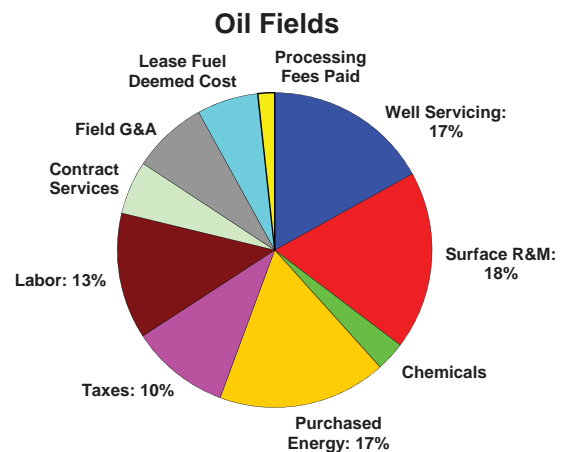
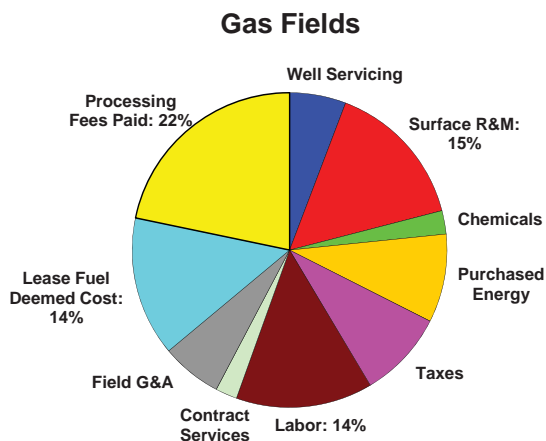
While overall Leader performance stands at 95.7% Uptime (per Ziff Energy’s proprietary methodology), a majority of Canadian oil fields are only achieving 90-95% Uptime, losing millions in revenue. Ziff Energy calculates uptime targets for each Peer Group of similar fields. Reducing the frequency of production downtime incidents not only increases revenue, but also reduces unit operating cost. 

### Total Oil Production Loss Due to ‘Downtime’



Total Oil Production Loss: 1.5 Million Barrels, \$116 Million @ \$77.50/Bbl

## 2010 Average Operating Costs



## Ziff Energy in the North Sea

Paul Ziff, CEO

The North Sea is one of the leading Offshore mature basins, characterized by a variety of operating regimes (3 countries); regions (North; Central South; Norwegian Sea); and quite diverse types of production facilities, mainly fixed, though also floating, and with significant high pressure/high temperature gas reserves.

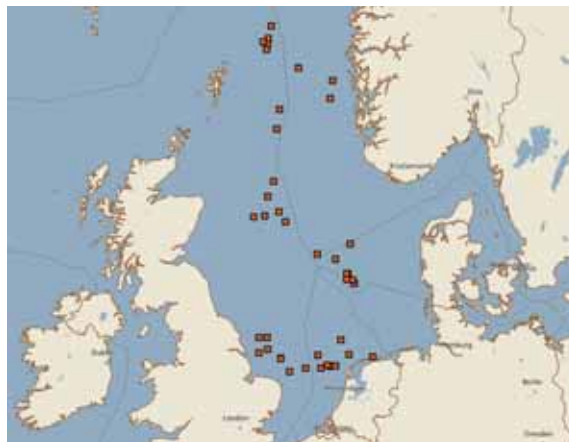
Ziff Energy began North Sea operations benchmarking in 2008-9, with a multi-client study of 'Mature Hubs' that included 15 Assets in the UK and Denmark, operated by 5 Major and Intermediate producers, totalling 860 MBOE/d. The operations performance of each North Sea hub was compared against other North Sea hubs and against mature hubs in the Gulf of Mexico and Brazil. At this time Ziff Energy began adding UK Associates for on-site local expertise.

The second significant project was in 2010, assessing the *Uptime for BP's North Sea portfolio*, Operated and Non-Operated, in the UK and Norway. A total of 470 MBOE/d was assessed as part of a global project that BP awarded to Ziff Energy to evaluate the reliability performance of 120 of their large producing assets.

In 2011, Ziff Energy assessed the operating cost and production reliability for all Shell assets in the region, through 4 entities: ONEgas East in the Netherlands; ONEgas West in the UK, Southern North Sea; CNNS in the Central and North Sea, and Cross Border for several assets that straddle the UK/Norway border.

In contrast to pre-Ziff Energy benchmarking in the North Sea, we did not convert all assets to BOE's for comparison, because the production characteristics and economics of oil and gas are very different. The latter is particularly true today, when Brent sells for \$112/Bbl, and Gas at the National Balancing Point for only \$9.30/Mcf, a ratio of 12:1, far different than the heat equivalent of 6:1. Converting gas to oil at a skewed ratio can

## North Sea Assets in Ziff Energy Database



generate misleading results. We only compare oil assets to other 'like kind' oil assets, and similarly gas assets with other gas assets.

Ziff Energy is active in 40 countries around the world, and has built a database including over 4,000 assets, with over 900 Offshore. This enables us to group and *compare peer assets, both within a region, and between regions*, to glean new ideas regarding potential performance.

*'By engineers, for engineers'* describes Ziff Energy's approach to benchmarking. Ziff Energy's technical staff includes seasoned Project Managers; the Center for Upstream Benchmarking Excellence; and local Associates including David Richmond in Aberdeen, and Dr. Richard Parker and David Bott in London, providing decades of UK North Sea knowledge and operating expertise.

Having assessed a huge variety of Offshore assets around the world, from fixed platforms, TLP & Spars, and FPSO's, Ziff Energy is ready to provide expanded service to North Sea operators. 

## New Upstream Development Projects? Reality Test your Operating Plan & Budget

Richard Tucker, Vice President, Marketing & Client Relations

Delivering new projects is a key focus for all E&P companies. As part of planning for an upstream production asset development, a best practice is to evaluate operating cost and downtime estimates/assumptions in the plan, using peer data as a reality check. Ziff Energy has conducted such evaluations using peer data from the firm's Operating Cost database. Ziff Energy has evaluated large new offshore and onshore field developments, in a number of countries. The firm can model future operating costs *over the life of the field*. This is important since the lifetime operating costs far exceed the initial capital cost. We assisted one operator with their development planning to achieve appropriate operating cost levels within each phase of a large Greenfield onshore oil field development in Asia, and another with a planned Gulf of Mexico Deepwater development.

The use of appropriate real peer operating data, cost and uptime performance, enables the E&P client to *incorporate reality-based estimates* as part

of their development planning and budgeting. Failure to do so can result in flawed economic evaluations and investment decisions. Failure to test development assumptions against real data can also lead to painful performance surprises once the asset is on-line.

*Operations Performance Benchmarking is Ziff Energy's primary business.* Ziff Energy has successfully executed **180+ upstream benchmarking projects**, far more than any other consultancy, and as a result has available excellent data to evaluate the upstream production operations component of Development plans.

Ziff Energy is particularly well positioned to evaluate large offshore developments involving Deepwater production systems or Floating Production, Storage & Offloading (FPSO) vessels. **Ziff Energy possesses**

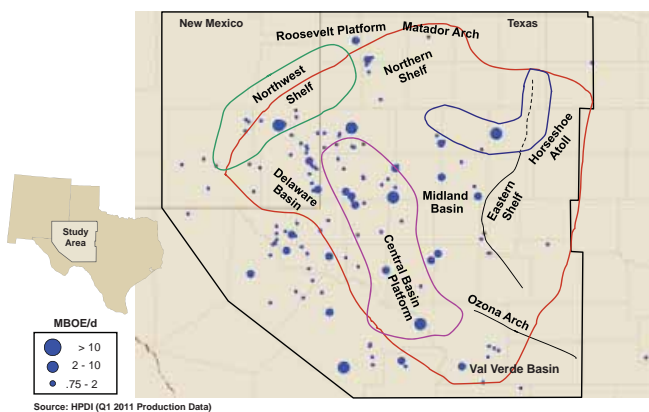
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## Ziff Energy Group Launches 7<sup>th</sup> Permian Basin Benchmarking Study to Combat Soaring Operating Costs in the Largest Onshore U.S. Oil Producing Basin

Richard Tucker, Vice President, Marketing & Client Relations

Ziff Energy Group has launched the firm's 7<sup>th</sup> Permian Basin Improving Field Productivity benchmarking study to evaluate operating cost trends in fields in the large oil and gas basin in West Texas and Southeastern New Mexico. This edition of the multi-client initiative will analyze *operating cost and uptime reliability data* for the 12 month period July 2010 to June 2011. Leading operators, who collectively produce 40% of the basin's oil and gas, are providing data on their fields in the basin. Ten operators are participating – all but one of the Top 5 operators in the basin, plus a number of Independents. The map below displays the diverse locations of Permian fields to be analyzed. Several operators are benchmarking for the first time; the rest have been in prior Ziff Energy Permian study editions.

### Permian Basin Fields of Participating Operators



The Permian Basin remains the *largest onshore U.S. oil-producing region*; with production of about 850,000 barrels of oil per day (a quarter of the nation's domestically produced oil). *With low natural gas prices, interest in Permian oil has increased, and production of oil and gas in the basin is on the rise.* Permian operators are industry leaders in handling large volume, low margin oil fields, with the challenges of numerous wells, extremely high water cuts, reservoir pressure maintenance, and capital intensive processing operations. The basin is the *world leader in CO<sub>2</sub> floods* (enhanced oil recovery) to increase the recovery factor. Other large Lower 48 oil-producing regions include the Gulf of Mexico Deepwater and the new, rapidly growing, Bakken Shale resource play in North Dakota.

In 1996, the Permian basin was the focus of Ziff Energy's very first U.S. operations benchmarking study. In the prior (6<sup>th</sup>) edition of the study, conducted 4 years ago, fields were analyzed on a like-kind basis within 7 oil and 2 gas Asset Groups. Waterflood fields were directly compared with 2 Asset Groups based on the geologic formation produced, while tertiary (CO<sub>2</sub> flood) fields were analyzed within a separate Asset Group. An additional Asset Group to cover the Wolfberry and Wolfork horizontal activity will be added to this edition.

Industry continues to focus on *reliability to maximize production uptime* consistent with *safety, health, and environmental stewardship*. The 7<sup>th</sup> edition will be the first to benchmark, for the Permian Basin, Ziff Energy's family of **Uptime Reliability metrics**:

- **Operating Efficiency (OE):** % actual production relative to the field's capacity, determined from an analysis of daily production
- **Operating Efficiency (Unplanned):** OE excluding Planned Downtime
- **Mean Time Between Incidents (MTBI):** the average time in days between downtime incidents (an incident occurs when production decline by a significant % relative to a moving average)
- **Mean Time To Recover (MTTR):** the average time in days to "recover" from an incident (i.e. restore production to the moving average)
- **Ziff Energy's Production Reliability Index (PRI):** the ratio of MTBI to MTTR, reflecting the magnitude of losses.

Ziff Energy's benchmarking studies have found a surprisingly wide range of Uptime performance, which represents an improvement opportunity for industry worth tens of millions of dollars of annual revenue.

Participating companies will receive confidential, 'blinded' asset level comparisons of their fields to asset group fields. "In our study, we will measure each field against fields with similar key characteristics for a meaningful comparison," said Donna G. Elwood, Manager of this year's Permian operations study, and a registered Petroleum Engineer with extensive operating experience in the basin (with 2 large operators). "This provides operators with consistent, meaningful performance information, based on data from peer fields, as to where they should focus in 2012 to improve their production efficiency, optimize costs and increase cash flow". For the many fields included in prior editions, clients will also receive an insightful **trend analysis** comparing costs and production volumes over time.

Ziff Energy intends to offer a **Best Operating Practices Workshop** at the conclusion of the study, for the exclusive benefit of study participants. The full-day workshop will feature presentations by clients chosen specifically for their strong performance in specific aspects of Permian operations (e.g. well servicing). There is much "give and take" among workshop attendees, discussing common challenges for a number of chosen topics, and also plenty of networking time. The field operations professionals who attend Ziff Energy workshops have always highly rated the opportunity to interact with their peers.

Companies that are not yet involved in this year's Permian Basin study may still participate, *if they act quickly*. For further information about assessing the production efficiency of your Permian fields, e-mail or call Richard M. Tucker, VP Marketing & Client Relations, richard.tucker@ziffenergy.com at (713) 985-1583 or (888) 736-5780 (toll free).

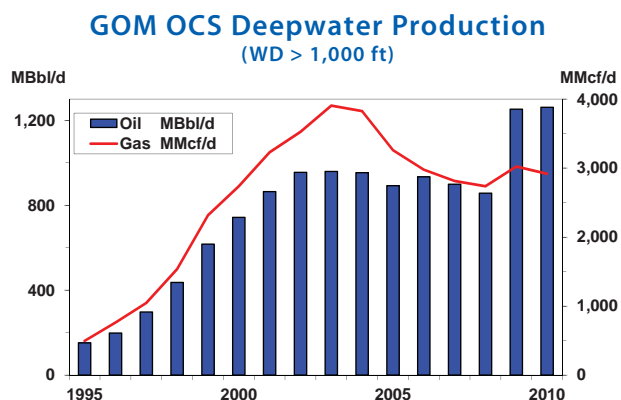
<http://www.ziffenergy.com/eandp/multiclient.aspx>

## Ziff Energy Completes 8<sup>th</sup> Gulf of Mexico Deepwater Operations Study to Enhance Production Efficiency & Manage Cost Challenges

Richard Tucker, Vice President, Marketing & Client Relations

Ziff Energy recently completed the 8<sup>th</sup> edition of its **Gulf of Mexico Deepwater Improving Field Performance (IFP)** study, which evaluates 2010 operations for 36 assets. While production in the Gulf of Mexico Deepwater was in the spotlight last year with the unfortunate Macondo incident, the region represents by far the most important domestic oil supply area for the U.S. (other significant Lower 48 areas include the 100-year old Permian Basin in West Texas, and the rapidly expanding unconventional Bakken play in North Dakota).

In recent years, the Gulf of Mexico Deepwater has developed many new 'world class' discoveries. While hurricanes impacted oil and gas production in 2005, 2006, and 2008, the graph shows **production surged by over 250,000 Bbl/d in 2009**, with the start-up of many new assets (including the Atlantis, Thunder Horse, Blind Faith, and Thunder Hawk semi-submersibles, the Tahiti and Perdido spars, and the Neptune & Shenzi tension leg platforms). **Additional Deepwater assets began production in 2010** (Marathon's Droszky subsea development and ATP's additional well tied to its Titan floating drilling and production platform) – enough to keep oil production flat with 2009 in spite of the Macondo incident. Given the drilling moratorium, Deepwater production is expected to fall moderately in 2011.

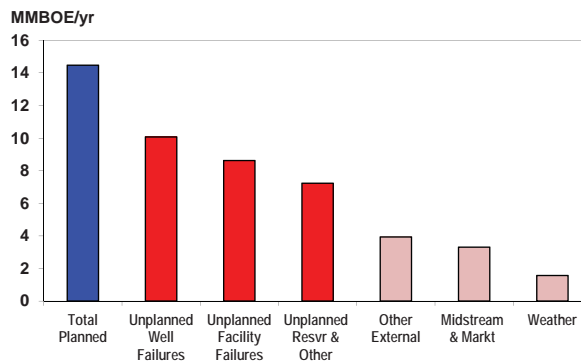


Most Deepwater gas production is associated with the oil, and growth in Deepwater oil production has been essential to offset gas production declines this decade in the mature Gulf of Mexico Shelf.

Ziff Energy is the **leading consultant for evaluating offshore operating performance**, with extensive assessment programs for both Deepwater and Shelf operations. Our offshore asset-level database includes extensive cost data for 70 Deepwater assets and 800+ Shallow depth fields operated by 20 operators in many regions, including the Gulf of Mexico, Asia Pacific, North Sea, West Africa, and South America.

This year's study updated the **Operating Cost Efficiency and Uptime Reliability Metrics** last measured in 2009 with the 7<sup>th</sup> Edition. The Uptime metrics are based on analysis of daily production and include "deferred production", the mean time between downtime incidents (MTBI), and mean time to recover production (MTTR). Industry continues to focus on **system reliability to maximize production uptime** consistent with *safety, health, and environmental stewardship*. Ziff Energy's Deepwater study found a surprisingly wide range of Uptime performance, which represents an improvement opportunity for industry worth tens of millions of dollars of annual revenue for most assets. Indicating the size of the incentive, the graph shows the study assets' deferred production for 2010 associated with planned and unplanned downtime by cause: facility failures (on the platform), well failures (subsurface), midstream & market (e.g. pipeline), reservoir, weather and other external. Weather was the smallest factor. **The value of the unplanned deferment (\$1.5 billion) was 1.6 times the total OpEx (\$0.9 billion) of the assets!**

### Reasons for Deferred Deepwater Production



"Study participants received detailed diagnostics for each asset, compared on a 'like kind' basis with peer assets and identifying potential savings in each of 15 cost categories," said Joe Kilchrist, Ziff Energy's Director, Offshore Operations, who lead the Deepwater study team. Ziff Energy is meeting privately with each client regarding their identified improvement opportunities.

Deepwater operators interested in "backing into" the study on a Late Participation basis should contact Richard Tucker, VP Marketing & Client Relations, at 1-713-985-5183 or richard.tucker@ziffenergy.com. <http://www.ziffenergy.com/eandp/multiclient.aspx>

## Ziff Energy Assessing Operations Performance of Gas Plants in North America

Sergey Turchin, Manager, Operations Consulting Services

Many plays (especially conventional) are mature and in decline. With low gas prices, gas plant operators are under pressure to be efficient and *prove it*. Ziff Energy's 2011 **Western Canada Sedimentary Basin Improving Field Performance** study includes a performance assessment for 15 gas plants, half of which process sour gas. The total throughput of these plants in 2010 was 1.6 Bcf/d at a total annual operating cost of \$289 million.

Ziff Energy has developed a model to evaluate gas plant operating cost efficiency, focused on unit operating cost, incorporating a number of interrelated factors:

- plant process complexity
- facility utilization rate
- size of plant (processing capacity)
- composition of inlet gas or products.

As the throughput of a facility decreases, the operating costs will in most cases not decrease in proportion to the throughput, because the majority of costs in the facility are fixed. Therefore, unit operating costs, expressed in dollars per unit throughput (BOE or McfE), will increase. Ziff Energy defined a theoretical **Facility Utilization Factor** to represent the ratio of unit operating cost when a plant is not operating at full capacity to the

unit cost when it is running at full capacity.

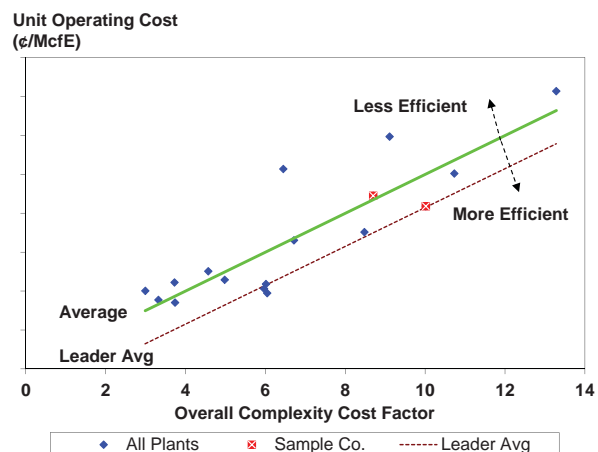
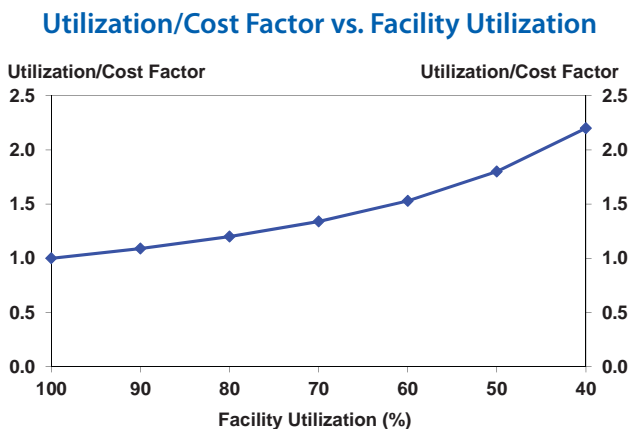
Ziff Energy defined an Overall Complexity Cost Factor (OCCF) as a function of the 4 factors listed above, and applied it to assess each gas plant's operating cost performance.

Ziff Energy's assessment includes detailed information on *Energy Use, Surface Repair & Maintenance Cost, Labour Cost* as well as Total Unit Operating Cost, providing a true understanding of cost drivers and gaps in performance. We also assess each gas plant's Uptime Reliability, based on daily throughput data along with downtime reasons. We provide a separate evaluation of planned and unplanned downtime.

Our study helps the gas plant operator identify which cost areas offer the greatest potential for reduction and meaningful savings, and whether their plant's downtime is excessive relative to peers.

If U.S. gas plant operators are interested in having their plants compared with similar Canadian plants, please contact Sergey Turchin, Manager, Operations Consulting Services, at (403) 234-4298 or [sergey.turchin@ziffenergy.com](mailto:sergey.turchin@ziffenergy.com).

### Total Unit Operating Cost vs. Overall Complexity Cost Factor



## New Upstream Development Projects? (continued)

**detailed operating cost and uptime reliability data for over 70 Deepwater assets and 30 FPSO's.** Ziff Energy just completed its 8<sup>th</sup> Gulf of Mexico Deepwater operations benchmarking edition, evaluating the 2010 operations performance of numerous spars, TLPs and semi-submersibles. The firm completed several new FPSO benchmarking assignments this year, examining 2010 performance.

Ziff Energy's evaluations are performed by consultants with extensive offshore operations experience, assisted by the firm's unique **World Center**

**for Upstream Benchmarking Excellence!** Our *senior offshore operations engineers and Associates* have 15 to 30+ years of experience with a variety of leading operators (Majors and Independents). Our style of work is collaborative – we ensure a highly interactive process between our technical team with the client's Development project team. This is very important given the unique characteristics of each Development.

## LNG Exports from Western Canada

Edward Kallio, Director, Gas Consulting

In the years leading up to 2008, the North American gas industry was hard-pressed to replace gas declines with new production, and the prospect of importing 5 to 10 Bcf/d of LNG to balance supply and demand was very real. Various operators spent billions to triple U.S./North America LNG import capacity to 18.5 Bcf/d. But due to ample gas supplies, U.S. LNG import facilities are taking under 1 Bcf/d, a mere 5% of capacity. With the advent of horizontal drilling and fracture technology, the full cycle cost to produce gas from shale plays has dropped, resulting in a step-change in North American natural gas reserve additions and production.

The decline in full cycle gas costs has produced a surplus of gas supply at lower price levels, bringing gas prices down to around \$4/MMBtu currently, from \$8 to \$10/MMBtu in 2007/2008. By contrast, oil prices have been robust, in the \$80 - \$105/Bbl range and the ratio between oil and gas prices has widened to current levels around 20:1 (vs. 6:1 Btu equivalency).

Producers with acreage and gas reserves in the Horn River, Montney, Cordova Embayment, and Liard Basins seeking to monetize their natural gas, are faced with current sub \$4 local gas prices, making it increasingly difficult to justify large capital programs in Western Canada.

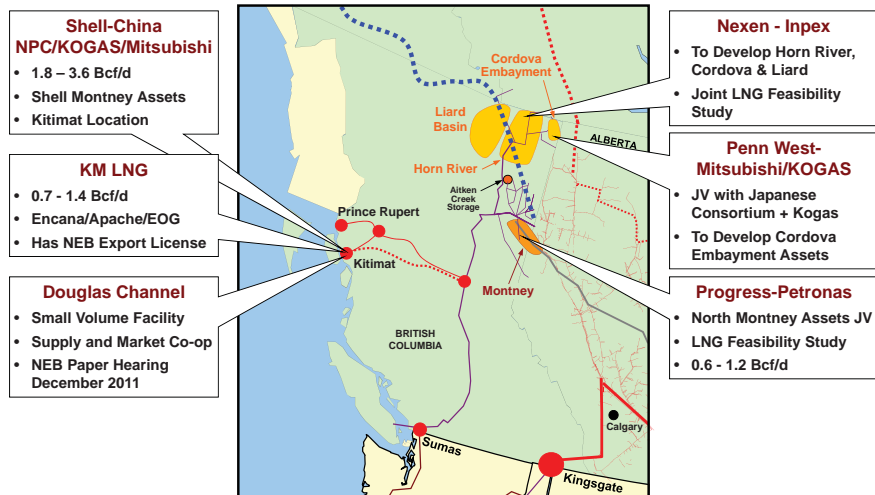
So, what is a producer with large holdings in Canadian Unconventional plays to do? How can this wide differential between the value of oil and gas be closed?

Because Asian gas prices are generally set based on a basket of crude oil (roughly 85% of Japanese Crude Cocktail or JCC), and western Canadian gas can be liquefied and shipped to Asia, there is a natural arbitrage opportunity for Western Canadian producers. Currently, gas prices in Asia are over \$13/MMBtu, and Western Canadian gas is selling for sub \$4 - a very large differential and attractive for Producers to exploit.

Several projects have been proposed to liquefy Western Canada supply for transport to Asian markets. The most advanced is KM LNG, located in Kitimat, and owned by Apache, EOG and Encana, all with large land holdings in the Horn River Basin. The Canadian National Energy Board (NEB) conducted an Export Licence Hearing in June and a decision providing an unconditional 20 year permit was released in October 2011. Ziff Energy provided an expert report that presented a view to the year 2035 on North American supply, demand, and markets and testified at the Hearing.

Several other LNG projects are in various stages of development. Douglas Channel, a smaller project, is also located at Kitimat, for up to 250 MMcf/d of gas exports. An NEB Export Licence Hearing has been ongoing with final arguments due December 7, 2011. Other projects in earlier stages of development include Shell, with significant buy-side interest and large land holdings in the Montney area; a Progress Energy - Petronas venture, to develop Progress Energy acreage in the Montney region; and a possible LNG Liquefaction Joint Venture, and a Joint Venture between Penn West and an Asian group including Mitsubishi and Kogas to develop acreage in the Cordova Basin and possible liquefaction. Finally, Nexen has recently partnered with INPEX to develop very extensive land holdings in the Horn River and other shale basins in Western Canada. 

Canada LNG Liquefaction



## Newsletter?

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