

## Energy Themes/Issues for the New Millennium

**Paul Ziff, CEO**

**A**s we enter the new millennium, many challenging issues face the North American gas industry. Below we outline some themes executives will be addressing in the next several years.

### GAS SUPPLY, ON THE CONTINENT

How high are actual decline rates for the entire producing population, and what does this mean? Is it negative, foretelling a pending shortage, or positive that producers have discovered "just in time" gas, and are able, with superior technology, to increase deliverability quickly *and* maximize net present value. Knowing the level and trends in "yields per completion" and "full cycle economics" by basin (see Article, page 3) will be critical for understanding future gas supply, by location, changes in pipeline flows, and related strategy issues.

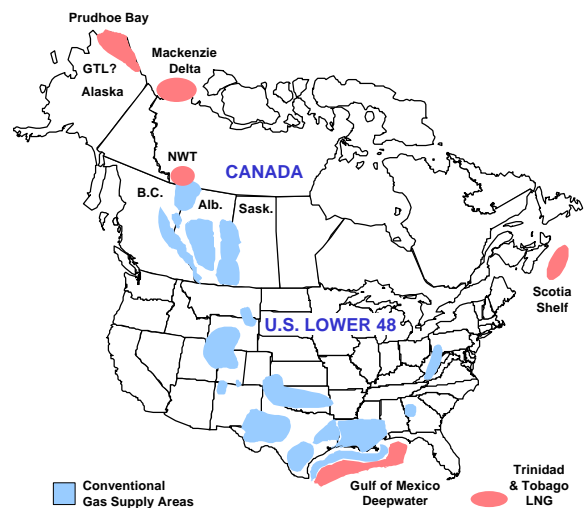
### IMPACT OF HIGHER GAS PRICES ON NEW SUPPLIES & MARKETS

*If* NYMEX and Alberta gas prices strengthen further, what are the consequences for the continental gas demand, and for gas "on the frontiers".

Can North American gas supply continue to expand? Can that expansion continue to rely on production within the continental framework, or will it, as US oil did in the 1970s, become increasingly dependent on supplies from outside the continental framework to grow or even remain at current levels? In the longer term, will hydrates finally become a gas supply source more than a gas pipeline problem?

and gas in the Northern Territories of Canada (i.e. north of 60th parallel), the Mackenzie Delta of Canada, and Alaska. The startling feature is that except for the last 2 sources, all the rest have been or are being developed. The full cost and marginal cost for each of these sources has important implications for onshore gas producers, and also for Continental gas markets. And also for market expandability - each of the first 4 frontiers will see tremendous expansion over the next 5 to 10 years. The Scotia Shelf, GOM Deepwater, and LNG are located quite close to markets relative to other Continental gas sources. In the longer term, but of greater importance, if a pipeline is built from the far north of Canada & Alaska, it will be huge, and operate at high capacity to reduce unit costs. This could have major implications for the North American gas industry. Can gas-to-liquids technology compete with pipelines in remote areas such as Alaska?

**North American Frontier Gas Supply Areas**



### New Gas from the Frontiers (see map)

The North American gas frontiers include: the Deepwater Gulf of Mexico, the East Coast of Nova Scotia, LNG from Trinidad and Tobago, new coal seam basins in the US and Canada,

### Gas Markets

Some gas markets (fertilizer and petrochemical, single cycle gas fired electrical generation) are price sensitive. US industrial gas use peaked over a year ago, despite the boom.

## index

Page

1. Energy Themes
2. Expansion of RFOC
3. Full Cycle Economics
4. Cdn E & P Performance
5. New Award
6. Maritime Gas
7. World Pet. Congress
8. Best Op. Practices
9. Rocky Mountain Gas
10. Gulf of Mexico Studies



# Expanded Scope of Ziff Energy's RFOC Project Help for International Operators

**Adrian Goodisman, Sr. VP, Exploration & Production Services**

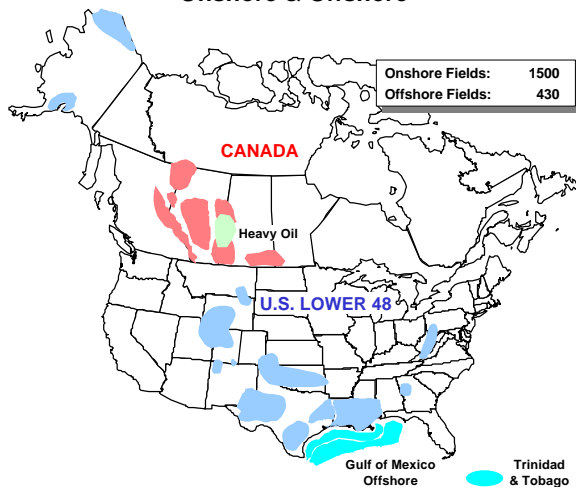
Six years ago, Ziff Energy Group embarked on a project to assist operators to reduce their operating costs by building a detailed database of field level costs (titled RFOC - Reducing Field Operating Costs/Best Practices). By utilizing this database, and by participating in regional/focused multi-client operating cost benchmarking studies, clients receive the information to measure and benchmark individual field performance. They are able to identify high cost line items on Lease Operating Expense statements by comparing their results to similar fields from other operators. To date, more than 100 North American E&P companies have participated in the project. The database now contains detailed operating cost information on over 1,900 fields including 395 Shelf fields and 35 Deepwater fields. Additionally, with the evolution of this project, a database of *leading North American Operating Practices* by Region is also being developed.

cost areas in their fields, compared to similar North American fields. Additionally, once the gaps have been identified, leading North American operating practices are shared with international operators to help them improve operations.



Adrian Goodisman (center) reviews BP Amoco's Trinidad & Tobago's field performance with Robert Riley (right) - President, West Business Unit, and Brian Besson - Operations Manager.

### North American Operating Cost Areas - Onshore & Offshore -



Ziff Energy recently expanded the RFOC project to assist international operators with their task of reducing field operating costs. By leveraging off Ziff Energy's proprietary database, international operators have been able to identify specific high

In a recent initiative in the Caribbean (offshore Trinidad), Ziff Energy evaluated a variety of offshore assets and compared them to similar Gulf of Mexico fields. Working with regional experts, we selected peer fields from the database to benchmark the Caribbean fields. One operator not only used the benchmarking study to identify high cost areas in their fields, but also used the study to set "realistic" targets for their asset teams to improve performance.

International operators, if you would like additional information on how we can help you improve your field performance, please contact Richard Tucker, VP Marketing, Hank Kelly, VP Offshore or Adrian Goodisman at (713) 6278282, or visit our website at [www.ziffenergy.com](http://www.ziffenergy.com).

# Gas Prices, Full Cycle Economics & Drilling in North America

With the volatility of recent gas prices, particularly with high summer peaks and lower prices in the traditional winter period, one wonders what gas prices will be in the longer term? This is the controversial question in the new US National Petroleum Council study examining the prospects for a 30 Tcf US market.

Over the last decade, our firm has taken the premise that long-term gas prices, in any basin, will be based on "full cycle" gas economics. The short-term price will gyrate around this figure because of periodic supply factors (too much, or too little drilling), transportation aspects (short or long on pipeline capacity) or market issues (a recession) that reflects the near term --- one to two years. This premise assumes no major "break" in the yield of new gas wells; our extensive analysis in both Western Canada (Western Canadian Supply & Deliverability Study, 1999) and the Gulf of Mexico validates this premise.

## FULL CYCLE ECONOMICS

Our definition of "full cycle economics" includes all the costs a producer bears, including return on invested capital. The underlying premise is that if a producer is achieving full cost recovery, and a return, they will reinvest in new activity (past behavior in many regions suggests that the prospect of full recovery is enough to stimulate strong producer response).

The cost components we include are:

- *Finding & Development (F&D) Cost* (includes Exploration and Development spending)
- *Operating Costs*
- *Return on Invested Capital*
- *Royalties* (a fixed percentage in the US; in Canada, varies by price and production level)
- *General & Administration Costs*
- *Financial/Corporate Costs*
- to arrive at a net cost for *dry gas*, we subtract the revenue from byproducts, primarily liquids.

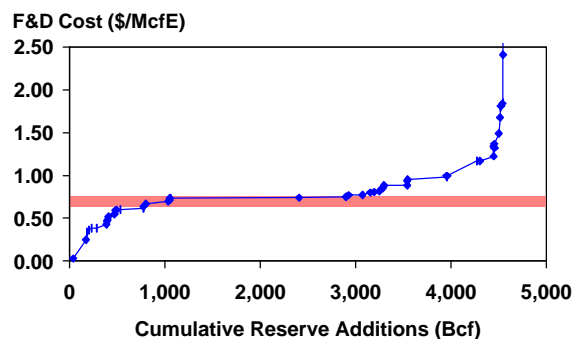
While F&D information is easy to obtain for an entire company on a BOE basis (from the Annual

Report or 10K), it is difficult to obtain F&D for gas only operations, and F&D is unavailable at a basin level from public sources.

However, since 1987 in Canada, and since 1996 in the US, Ziff Energy Group has undertaken a large number of regional studies that gather detailed data from a wide variety of active producers and explorers, for Operating Costs, and Finding and Development Costs. Each regional study is an intensive, engineering and financial effort, costing from Cdn \$250,000 to \$1+ million (Gulf of Mexico). The many regional projects (15 in the US and 20 in Canada) represent many millions of dollars of research, involving over 100 E & P companies across North America.

By collecting operating costs for various types or categories of fields in a basin, and finding and development costs for various strategies in a basin, we are able to produce **supply cost curves** for specific gas basins, based on real E & P experience. (In the past, most basin supply analysis has been based on averages, interpolated from macro stats; the results are susceptible to many assumptions, vs. "real life".) Further, as the following curve shows for a major strategy in Western Canada, the amount of supply found is not uniform.

**F&D Costs vs. Cumulative Reserve Adds**  
One Alberta Gas Strategy, 1994 - 1998



Our preliminary analysis indicates that the average NYMEX price is tracking relatively close to the Gulf of Mexico Shelf Full Cycle Costs. By contrast, the Alberta netback price currently *far exceeds* the full



# Canadian E & P Performance

## Marking the End of the Millennium

### Exploration & Production Services, Canada

What can we say about 1999? It was a bumpy ride. Prices came into the year at record lows for oil, but have rebounded to 9 year highs due to OPEC constraint and improving Asian economics. Gas prices enjoyed record high summer levels as warm US weather created demand for increased electricity generation, only to drop in recent months due to unseasonably warm winter weather and high storage levels.

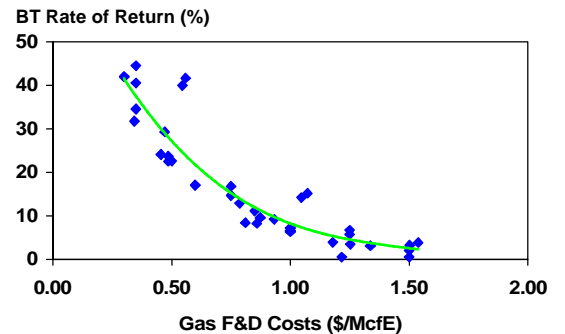
In Western Canada it has been a *record year for gas completions* thanks to high prices and anticipation of increased export capacity. Additionally, oil drilling has surged in recent months. This makes the forecasts for record overall drilling activity and cash flows in 2000 seem all the more confident.

The Canadian oil and gas industry is a “price-taker”. Therefore, since low-cost producers win, an accurate and objective portrayal of comparative performance is key to reducing overall costs and increasing the bottom line.

The 13<sup>th</sup> edition of Ziff Energy Group’s Western Canadian F&D Cost study analyzed economic performance and rates of return by strategy area. This unique approach to F&D analysis takes into account the complexities in the WCSB on a risk (geological complexity, costs, cycle time) and reward (reserves, product) basis. With the 35% increase in F&D costs from 1997 to 1998, more and more companies fell below the 10% hurdle

rate on their before-tax rates of return. Will this trend continue for 1999 even with the support of increasing product prices? While price drives level of activities, competition often determines costs at the strategy level.

**Western Canada Natural Gas Economics**  
1998 - 1999

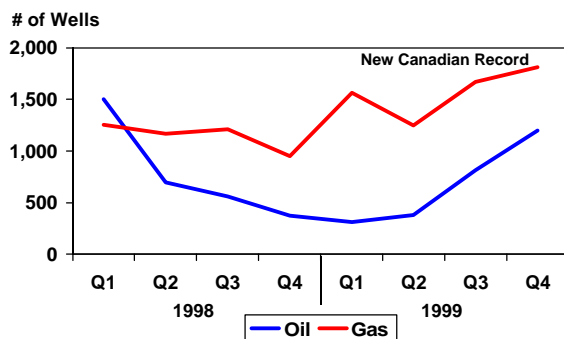


It’s not easy to make an accurate prediction of F&D performance for 1999, due to the impact of increased overall activity levels, and the re-emergence of oil drilling activity in recent months. However, there are some leading indicators. Land sales reversed their trend from 1998. Although total acres purchased and bonuses paid were similar year to year, the strong upward trend in investment for the last half of 99 parallels commodity prices. Moreover, increasing average prices for the higher risk areas (Alberta Foothills, British Columbia) indicates investment changes at the strategy level. Seismic activity was picking up heading into winter, although average active crew counts for 1999 were down 20% from 1998, reflecting the low prices earlier in the year.

These indicators, with a forecast for near record drilling levels, will stress overall investment effectiveness, and people capabilities. It seems clear that oil & gas companies that have an accurate representation of their comparative performance at the strategy level will be successful. Managing without these measures is the wrong way to ring in the Millennium.

For more information on the Ziff Energy Group Finding & Development Cost Study, contact Dave Cape at (403) 265-0600.

**Oil and Gas Well Completions**  
Quarterly 1998 - 1999





## Ziff Energy Group Launches New Award to Recognize Upstream Leaders

### Calgary Herald & National Post are Media Co-Sponsors

**P**aul Ziff, CEO of Ziff Energy Group, is pleased to announce the creation of the new **Ziff Energy Group Upstream Performance Award**, co-sponsored by the Calgary Herald and the National Post. This new award will recognize Canadian companies that are *leaders* in:

1. Finding & Development Costs - for success in replacing reserves at a below-average finding cost
2. Operating Costs - for success in operating production at a below-average lifting cost.

Ziff Energy Group (ZEG) is in the unique position of having conducted in-depth studies of finding and development costs in Canada since 1987. For the last 13 years, the ZEG F&D Cost Study has measured Finding & Development Costs for specific Oil and Gas Strategies in Western Canada. Since 1994, ZEG has assessed operating costs for over 400 Western Canadian oil & gas fields operated by more than 50 E & P companies. Its staff of 55 includes many senior industry specialists, with backgrounds in operations and exploration, and 15 to 25 years experience with Majors and Independents.

The awards will be based on Ziff Energy Group's evaluation of corporate performance during 1997-99 for Finding and Development Costs, and during 1998-99 for Operating Costs. Data from Canadian companies will be gathered in Q1 of 2000 and assessed by summer 2000.

Paul Ziff stated that: "in this time of uncertainty and lack of recognition in financial markets for oil and gas companies, it is appropriate to recognize companies that achieve *excellence in their upstream operations*. As an impartial consulting firm, Ziff Energy Group has conducted nearly 60 upstream benchmarking studies since 1987, more than any other energy consulting firm in North America or internationally."

We welcome the active involvement of The Calgary Herald, a leader in business reporting covering the Western Canadian energy industry. The National Post and its renowned business section, Financial Post, is participating as Canada's national newspaper.

For more information, contact Paul Ziff, CEO; or Dave Cape.

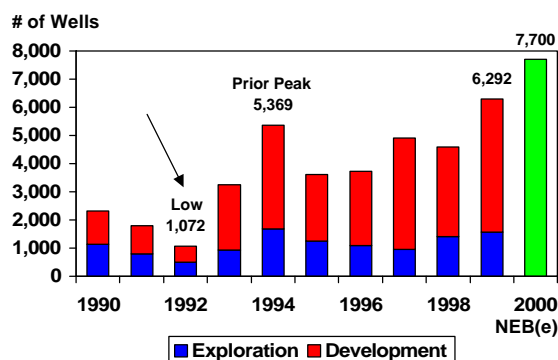
#### Gas Prices (continued from page 3)

cycle costs that we have tracked for many years. The *surge in Canadian gas drilling* is driven by the strong price recovery in Canada from 1995 lows, up 130%, versus the more moderate US recovery, +38%. This helps to explain the gas drilling activity in Western Canada relative to the US.

A year ago we forecast that Canadian gas completions would set a new record in 1999 --- they did, nearly 6,300 versus the previous high of 5,369 in the 1994 boom. At our November North American Gas Strategies Conference in Calgary, Ken Vollman, Chairman of Canada's National Energy Board (NEB) surprised attendees with a forecast of up to 7,700 gas wells in Canada in 2000. At this rate, in 2000, the number of gas

wells in Canada may amount to 75% of the US total, vs. just 30e% in the first half of the 1990s, an incredible surge.

**Western Canadian Gas Wells Completed**



## Maritime Gas Distribution

### Gas Arrives!

**Rick DeWolf, Sr. VP, Pipelines & Regulatory**

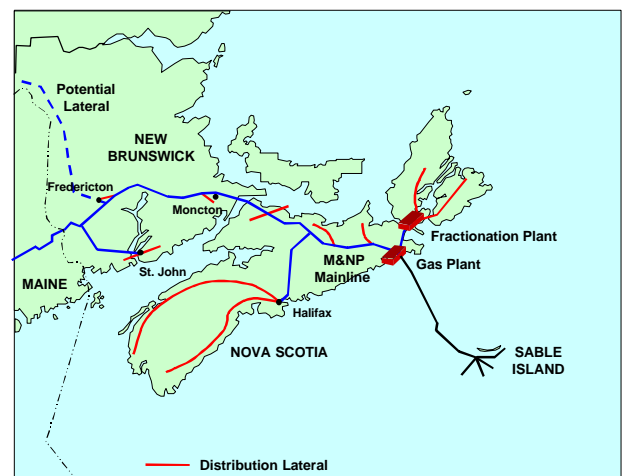
On Nov. 16, 1999, the Nova Scotia Utility and Review Board released its decision selecting Sempra Atlantic Gas (affiliated with Sempra from California) as the province-wide natural gas distributor. The Board rejected the application by the Westcoast/Irving sponsored Maritimes NRG, and four applications by local co-operatives and municipalities. The selection of Sempra Atlantic is the culmination of a process that commenced four years ago with the design and implementation of a new regulatory regime for the sale and distribution of natural gas in Nova Scotia. Earlier this fall Gas New Brunswick, a company sponsored by Enbridge Consumers Gas and local investors, including the prominent McCain family, was selected as New Brunswick's gas distributor.

From a regulatory perspective, it is interesting that Nova Scotia, followed by New Brunswick, adopted an *unbundled competitive market model* for introducing natural gas to these areas through the separation of the delivery and sale functions. However, the process used by each province to select the gas distributor was quite different. Nova Scotia elected a more innovative and open approach through an open competitive hearing process before an independent regulator. Each applicant had the opportunity to present its case, submit information/data requests to the opposing applicants, submit rebuttal testimony, and thoroughly cross examine the opposing applicants' witnesses. Further, interested parties as well as the general public had opportunities to fully participate in the process, through the submission of testimony, presentations and questioning of the various applicants. New Brunswick used a more traditional approach of requesting applications in response to a request for proposal. These were then reviewed confidentially by a select group of consultants and government officials. No public disclosure of the applications was permitted, and there was no opportunity by any other party to participate in selection process.

Another significant difference between the two Provinces is that the Nova Scotia government

established specific access targets for all the counties in the province which the gas distribution company is required to meet to ensure Nova Scotians throughout the Province have an opportunity to connect to the gas distribution system. The Province required the gas distributor to provide at least 62% of the homes with access to natural gas throughout the Province, with specific household targets by each and every county within a 7 year period. New Brunswick did not provide such a requirement.

**Maritimes Gas Infrastructure**



In the months to come, Provincial regulators will be conducting additional reviews into the licensing procedures and requirements for retail end user marketers who will be directly selling to households. The regulators will be conducting detailed examinations of the specific engineering and environmental submissions by Sempra Atlantic and Gas New Brunswick.

Rick DeWolf has been involved in the Nova Scotia process since early 1996 and continues to serve in an advisory role to the Nova Scotia Utility and Review Board. Questions regarding the developments of natural gas in the Maritimes as well as issues relating to current and future developments of natural gas from the Eastcoast Offshore can be directed to Rick DeWolf at [rdewolf@ziffenergy.com](mailto:rdewolf@ziffenergy.com).

# An Invitation to the 16<sup>th</sup> World Petroleum Congress

**June 11 - 15<sup>th</sup>, Calgary**

**Jim Gray, Chairman, Canadian Organizing Committee**

In June 2000, just 5 months away, Canada will welcome the world for the 16th World Petroleum Congress (WPC).

The 16th WPC will be an outstanding opportunity for networking, business development and, most importantly, the sharing of vision. It will be the petroleum event of the year 2000, with representation from across all sectors of the industry, and all areas of the world. We will all gain three main things from the 16th World Petroleum Congress - contacts, knowledge and memories.

The event's *keynote speakers* include many of the most respected authorities in the oil and gas industry today. These speakers who will share their visions and perspectives on international issues, and global approaches to doing business, include:

- M. Abdelmadjid Attar, Chairman, President and CEO, Sonatrach
- Sir John Browne, Group Chief Executive, BP Amoco p.l.c.
- Dick Cheney, CEO, Halliburton Company
- Victor Chernomyrdin, Chairman, Gazprom
- Enrique V. Iglesias\*, President, Inter-American Development Bank
- Pierre Jacquard, President, Chairman and CEO, Institut Français du Pétrole
- Secretary-General of OPEC
- Robert B. Peterson, Chairman, President and CEO, Imperial Oil Limited
- Jeroen van der Veer\*, Group Managing Director, Royal Dutch/Shell Group of Companies
- Stephen C. West, Minister of Resource Development, Government of Alberta.

\* to be confirmed

A range of timely and important topics will be discussed including: financing in international market economies, achieving international consensus on social responsibilities, development perspectives and initiatives from around the world, and Canada's unique approach in dealing with its diverse natural resources.

The 16th WPC will be an outstanding opportunity for networking.

Key members of the global petroleum industry, natural gas and related industries, government, academic, scientific community and media will all be in Calgary. What more convenient and accessible means to conduct business than to have all of the players gathered in one spot?

The *Global Business Opportunities Centre* is the exhibition component of the Congress, it will feature an interesting mix of national and international companies and organizations, and will provide a convenient setting for networking and discussions on opportunities and alliances.

*Social events* include Home Hospitality Night and a special Stampede breakfast. Canada Night, with the world-renowned RCMP Musical Ride, a celebration of Canadian cultural performers, and a vast array of national culinary delights, will be an incredible evening.

We are also offering *technical tours* that will explore some of the best in Canadian expertise and technology. Pre- and post-Congress tours of Canada's beautiful scenery, and uniquely Canadian social events, will ensure the 16th WPC will be an event not to be missed.

I encourage you to register for the Congress (contact information below) and secure your place for this event, June 11 - 15. I look forward to welcoming you to the 16th WPC.

**To register or for more information:**



## Find Money Saving Ideas and Production Gains in Best Operating Practices

Randy Schultz, Project Manager, U.S. E & P Studies

Ziff Energy's Reducing Field Operating Costs/Best Practices (RFOC) analysis has been actively used to help various US operators reduce operating expenses since 1996. Each study looks at operating costs and Best Practices on a peer field group basis within a geographic basin.

The recently completed *Mid-Continent* and *South Texas* Studies analyze each operator's field operating practices, and compare costs by cost category with other similar fields. At the conclusion of these studies, two Best Operating Practices Workshops were held. These full day workshops allow operators to share Best Practices on a company to company basis.

In the Mid-Continent and South Texas Basins, gas fields were grouped into 4 gas asset groups. The average area operating cost for gas in the mature Mid-Continent was \$0.53/McfE, but only half, \$0.27/McfE in South Texas. Oil in the Mid-Continent averaged \$5.15/BOE. As is often the case onshore, in South Texas the largest single cost component is tax expense (severance and ad valorem), followed closely by contract services, primarily compressor rental and water disposal charges. In the Mid-Continent Study, external processing costs came in slightly higher than taxes, due to gathering and compression services provided by third-party field service companies, a *complete turnaround in operating strategy compared to the previous, 1996 Mid-Continent Study analysis*. This change was largely due to the unbundling of gathering and compression activities, coupled with deregulation of these activities. These changes allow pipelines to provide gathering and compression to producers at a separate, non-regulated rate.

Participants assist in the study's design. Their input is solicited for the design of the asset groups and cost items to be captured, and also for the operating practices and issues the participants would like analyzed and reviewed in the study.

A major portion of all Ziff Energy Group studies is devoted to a more qualitative analysis of operating

practices. At the initial Client Advisory Group meeting, clients identify several key areas of field practices and select one area as the "Theme Topic". The "Theme Topic" is generally an area where costs are high and operations are problematic --- compression was chosen for both studies. In the Mid-Continent Study, clients also chose artificial lift, automation, chemical treating, and salt water disposal practices to be reviewed. South Texas Study participants chose automation, chemical treating, saltwater disposal, liquid loading and fracture stimulation.

In South Texas, contract service expense is a large cost element, due to compressor leasing activity. Over 40% of the study's 323 total compressor units are leased/rented, yet most operators both own and lease units. There is a practical explanation. New production volumes in tight gas fields decline rapidly during a well's early life. Leasing a larger compression unit initially to meet the widely varying volume requirements over the early period, then buying a smaller unit after production stabilizes, is a Best Practice.

To mitigate *liquid loading problems* not solved by soaping and swabbing, study operators have installed velocity strings, plunger lift, rod pumps, and capillary strings in their wells. Velocity strings are being used in over 70% of South Texas wells, and plunger-lift for 25%. Capillary strings are also used both to help keep wells unloaded (by injecting soap down through the capillary string), and to prevent corrosion (by injecting corrosion inhibitor down the capillary string). At the Workshop, participants discussed designing and evaluating remedial operations, and correctly identifying and quantifying the loading problem in each well beforehand (a step often skipped by operators).

Other innovative/leader practices identified in these studies include practices to reduce compressor maintenance costs, prefiltering water disposal fluids, establishing a specific scorecard or criteria to identify wells needing chemical treatment, and utilizing automatic soap launchers on wells requiring frequent soaping.

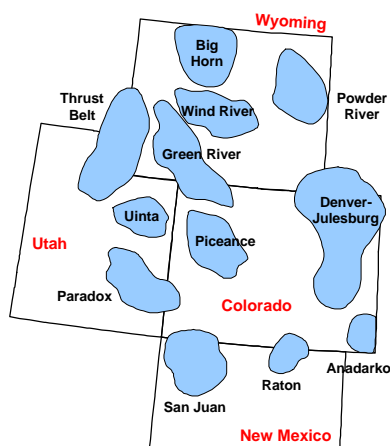
# Rocky Mountain Gas Prospects

Dr. Tom Woods, VP, U.S. Gas Research

**M**ore than *three fourths of the growth in lower-48 gas production over the last decade* has occurred *in the Rocky Mountain basins* (see map). The *share of lower-48 gas production from this area more than doubled*, from 7% in 1988 to 15% in 1998.

While Rocky Mountain gas production has been concentrated in *Northwest New Mexico* and *Wyoming*, this share has declined over the last 20 years, from 81% to 72%. Most new growth has been in *Colorado*, growing from 14% in 1979 to 21% in 1998. Most of this increase has been coalbed methane production in the Colorado portion of the San Juan Basin. Most of Utah's growth (7-8%) occurred by the mid-1990s.

Major Rocky Mountain Gas Basins



During the 1990s the growth in Rocky Mountain gas production has often come from "surprising" areas. Despite frequent forecasts of imminent production decline, San Juan gas production has continued to grow throughout the 1990s. Between 1992 and 1998, *San Juan gas production grew 75%*, providing *65% of the increase* in Rocky Mountain gas production. While Powder River and Green River basins have received much public attention, production growth in the Uinta and Wind River basins has been larger.

Rocky Mountain gas production is sold to three principal market areas: local gas markets in the producing area, Western gas markets, and

Midwest gas markets. The **Western markets** are the Southwest (Arizona and New Mexico), Basin Range (Utah and Nevada), Pacific Northwest (Oregon and Washington), and California. The **Midwest markets** are Mid-Continent (Oklahoma, Kansas, and Arkansas), Northern Plains (Montana, North Dakota, and South Dakota), Central Plains (Nebraska, Missouri, Iowa and Minnesota), and the East North Central states (Wisconsin, Illinois, Indiana, Michigan, and Ohio).

Through the late 1980s, just over half of Rocky Mountain gas production was delivered to areas outside the region. Almost 75% of those deliveries were to Western markets, principally *Arizona and California*. 25% was exported to gas markets in the Midwest.

The growth in deliveries *leaving* the producing areas surged after 1988, to over 2.1 Tcf (5.8 Bcf/d) in 1998. Through 1995 the growth was principally to Western markets. In 1996, however, deliveries of Rocky Mountain gas production moving eastward surged to 1 Bcf/d. In 1998, 36% of the deliveries went to Midwest markets, up by half from 23% in 1990.

Prospects for increased gas production in the Rocky Mountains are good. The growth of Rocky Mountain gas production and gas drilling activity under the low prices during the 1990s suggests that the factors determining future growth will be more on the market and gas transportation end. Ziff Energy has devoted a growing amount of attention to Rocky Mountain gas issues in the last 3 years to develop an integrated gas supply/demand/transportation framework to assess Rocky Mountain gas prospects. This includes assessments of field operating costs and investment expenditures associated with expanding Rocky Mountain gas production, assessments of market prospects on a state basis, and assessments of the availability of pipeline capacity to move Rocky Mountain gas production to markets outside the producing area. For more information, contact Ron Ford or Tom Woods in Houston.



# Gulf of Mexico Studies Maximize Client Margins

## Year 2000 Studies In-Line with Planning Cycles

Hank Kelly, VP Offshore

With improving oil and gas prices, companies using Ziff benchmarking studies for the Gulf of Mexico are in a position to reap the maximum profit potential from their Finding & Development investments and Operating Costs.

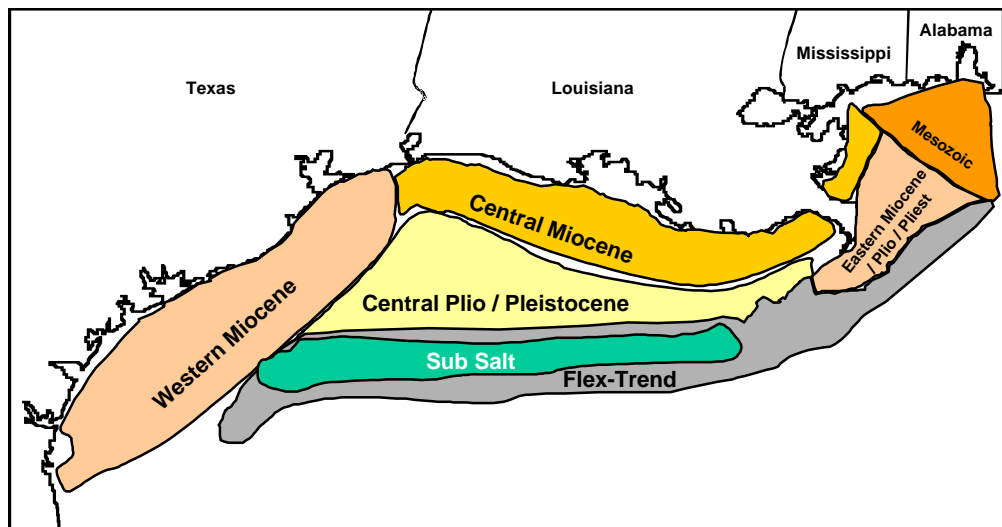
### FINDING AND DEVELOPMENT

Ziff Energy has completed the first ever *strategy level* F&D study in the Gulf of Mexico Shelf and Slope (to 1,500 foot water depth) area. This study focused on 7 key strategy areas, providing a comprehensive analysis of these areas, from broad overview to detailed, customized comparisons. The 7 key Strategy areas are based on geologic and economic considerations, and provide detailed F&D analysis unavailable from traditional corporate-level comparisons. The report also provides, in partnership with

*Schlumberger*, an *in-depth* analysis of the effect of *technologies* used by the E & P companies to maximize their effectiveness. This study provides data to a diverse group of clients who want to enhance their ability to focus on the areas providing maximum profit opportunity to their companies.

With some 25 billion BOE estimated remaining reserves (100+ Tcf and 6.5 BnBbl), the Shelf is still an attractive oil & gas play area. In the study, participants' F&D costs over the 3 year period were less than \$7/BOE and trended downward from '96 to '98. During this period exploration and exploitation expenditures grew from 42% of the total drilling budget in '96 to 53% in '98. This increase in drilling expenditure produced a 28% increase in BOE reserve adds overall. The majority of the reserve adds were gas; however, the group's oil replacement exceeded 100%!

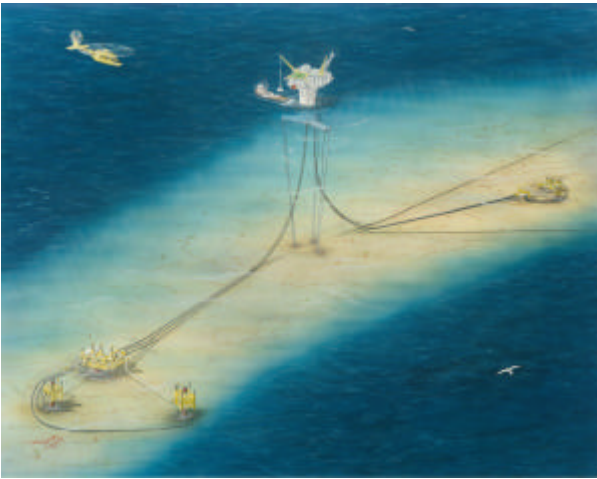
### Gulf of Mexico Shelf & Slope F&D Strategy Areas (7)



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## DEEPWATER RFOC/BEST PRACTICES

Each year the Deepwater portion of the Gulf of Mexico continues to add new and innovative developments to the mix of properties being evaluated for performance. This past year saw the first Mini-TLP design in operation and the continued growth of Sub-Sea systems in the offshore. Over the next three years, in all the offshore worldwide, three quarters of new developments will include Sub-Sea development.



Presented to British-Borneo - Courtesy of J. Ray McDermott, Inc.

The proliferation of Sub-Sea operations led our clients to choose this theme as the focus of our *Best Practices* portion of the study. To assure maximum value to the client group we engaged *Halliburton's SubSea Group* as *Technical Advisor*. The Best Practices portion provides key information on Sub-Sea development and operating issues. The data was collected on a current historical basis for: flow assurance, component reliability and failure analysis, maintenance & inspection, and operating practice, including training requirements.

The report was divided into sections: Recurrent Failures, ranked by frequency, Discussion of Operating Experiences, and a Summary of Best Practices. These sections address all key issues requested by the clients. In the recent Workshop

on Sub-Sea Operations 55 key Sub-Sea professionals (R&D and Operations) participated in a day-long information exchange.

The section on failure analysis frequency of occurrence found the two key issues in flow assurance are 1) ability to inject via the umbilicals, and 2) flowline fabrication and installation. The section on seabed facilities assessed an unusual number of control pod failures.

In the Operating Cost section, a *new trending* feature enables repeat participants to track their year-to-year performance in relation to industry. This can provide significant insights to participants on their own and industry driver relationships.

This year's study added a fourth asset grouping, the Compliant Sub-Sea Asset Group, which allows a more precise grouping of like-kind developments in the Deepwater. Additionally the Sub-Sea satellite Asset Group was presented with and without processing. Processing charges as an average trended up in '98.

The data provided to the clients participating in the study has clearly been useful --- multi-year clients are reaping benefits with an average reduction of 25% in average unit (\$/BOE) costs, maximizing their margins considerably in the current improved pricing of oil & gas.

## YEAR 2000 STUDIES IN-LINE WITH PLANNING CYCLES

Responding to client preferences, Ziff Energy has decided to aggressively improve the delivery timing of products to the Gulf of Mexico study participants, in order to coincide with planning cycle activities. This means that the studies will be initiated early in the year, with delivery in early summer. This will allow for early inclusion in next year's planning and an opportunity to adjust the current year's plan to meet opportunities provided by the data.

For more information, contact our Offshore Group in Houston.



*Energy Themes (continued from page 1)*

## **NORTH AMERICAN COAL & NUCLEAR**

In contrast to “conventional wisdom”, coal sales have expanded, and the nuclear industry has recovered to set a new high in output. Both sectors still have considerable underutilized capacity, and in the nuclear sector, new efficient aggregators are consolidating nuclear generation (similar to Dynegy and Enron in gas marketing a decade ago). Both are multi-billion \$\$\$\$ industries --- with huge investments, vested interests, and political clout. Nuclear actually helps achieve certain Kyoto targets, although the issue of spent fuel remains murky. Look for technological change, driven by the huge stakes. Even new nuclear mini-plants (100 to 200 MW) are conceivable, likely on existing vs. new sites.

## **PEOPLE CONSTRAINTS**

The demographics of the oil & gas industry are lousy - the “baby boomers” are moving through most companies; volatile prices and boom/bust cycles lead to frequent layoffs and subsequent shortages; young new grads are fewer in Technical disciplines, and the “.com” lure is powerful. Many young people are attracted to the IS/IT disciplines, vs. traditional oil and gas careers. Technology is helping reduce the people intensity, but fast enough?

## **THE CONTINUING IMPACT OF TECHNOLOGY**

Consider the impact that technology has made on finding, developing and producing oil & gas recently. 20 years ago (or even 10 years ago) 3D seismic, horizontal/multilateral wells, MWD/LWD and deepwater drilling/production platforms were really only beginning. Now these technologies are commonplace and part of normal operations. These technologies have made great impacts on such areas as the type of people employed in oil & gas, on where oil & gas companies operate, and on supply cost curves. Now consider the continuing advances in computer systems, miniaturization and satellite/internet communications, and one can only imagine what future advances technology will bring to our industry in coming years. On the market side,

distributed generation and fuel cells are poised for growth.

## **THE BOOM IN CANADIAN E & P**

Yes, it's here again, in a big way. The number of gas wells completed in Canada set a record high in 1999 (over 6,000) and will grow again in 2000. Canadian wells are shallower than US wells, but the onshore wells are more productive. Estimates for total oil & gas wells drilled in 2000 range between 13,000 and 16,000+ wells, close to the Canadian record of 17,000 wells in 1997. The boom has not yet translated into cost inflation, but it will, as slack capacity is absorbed. As well, major expansion of the Tar Sands (US\$3 billion in the next several years) will add to a heated up Western Canada industry.

## **INTERNATIONAL - STRANDED GAS: POSTER CHILD OF THE NEW MILLENNIUM**

The exploration orphan of prior decades --- “stranded gas”, which exists in large amounts, but not near a distribution system --- is being revisited as part of the “powering of the world”, especially the developing world. This gas will either substitute for generation fired by imported oil, or add incremental generation to fuel economic growth. This is a positive development for world economies, the E & P industry, and the economic standard of developing countries, but has implications for OPEC and future oil demand.

## **THE ENVIRONMENT AND KYOTO**

The Environment was a dominant and controversial issue in the '90s, and is not going away. The issue is sparked both by technology --- more advanced scientific analysis (although the scientists don't all agree) and by demographics --- the student protesters of the '60s, grown up, have a different optic than their parents, and *their* children are more passionate. Changes will be significant --- the only issues are how big, how soon, and at what cost. Government regulation used in the past is giving way to market-based approaches (e.g. tradable emission credits and effluent taxes) which are increasingly gaining

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support. And “Clean Air” boosts gas-powered electrical generation.

### EVOLUTION OF THE OIL & GAS COMPANY

While the oil & gas industry may not be in its twilight (long predicted), it certainly is mature, especially compared to the “.com” sector. This stage of maturity, combined with the internationalization of financial markets and shareholder expectations, is driving new solutions --- these include the *mega company* (e.g. BP Amoco (ARCO); Exxon Mobil; and Total Fina Elf), and extensive *outsourcing* of certain functions deemed “non-core”. At the Independent level, the broad and relatively cheap access to high technology delivers greater exploration success, at less risk. US rationalization onshore continues --- most US basins are now dominated by a small number of large regional consolidators, both

independents and majors. Increasingly the Majors, who are largely in exploitation/“cash cow” mode, are “gasifying” their portfolios; many Independents, more opportunistic, are in expansion mode. The Gulf of Mexico Shelf is in transition, as historically prominent Majors and large Independents move to Deepwater, and exploiters/consolidators take over the Shelf.

### BEST WISHES AND WELCOME TO THE NEW MILLENNIUM

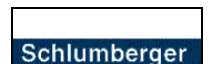
The new Millennium is historic. We at Ziff Energy Group wish you & your families, and your enterprises the very best in this New Year, and beyond. We are grateful for the opportunity to work with you in an industry characterized by many fine people, and many impressive accomplishments.

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## Thanks to our Technical Advisors

As we move into the year 2000, Ziff Energy Group would like to recognize and thank our Technical Advisors:

- **Booz-Allen & Hamilton Inc.** - Procurement Practices Advisor for the Theme Topic of the Permian Basin 3rd Edition Reducing Field Operating Costs/Best Practices (RFOC) Study
- **Collarini Engineering Inc.** - Reservoir Engineering Advisor for the Economic Analysis section of the Finding & Development Cost (F&D) Gulf of Mexico (Shelf/Slope) Study
- **Halliburton** - Technology Advisor for the Theme Topic, “Subsea Operating Practices”, in the Deepwater 2nd Edition RFOC study
- **Hanover Compressor Company** - Compression Advisor for the Rockies Conventional Gas (Wind River/Green River) RFOC Study
- **Schlumberger Inc.** - Technology Advisor for the Successful Technology Applications section of the F&D Gulf of Mexico (Shelf/Slope) Study (which focussed on Petrophysics, Geophysics, Drilling and Data Management).
- **Sproule Associates Limited** - Reservoir Engineering Advisor for the Economic Analysis section of the 13th Edition of the Canadian F&D study.





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