

PRESIDENT'S MESSAGE



We all have a story about where we were on September 11, 2001. For what it's worth, I'll share mine.

We had flown to Mexico City the evening before for meetings at Mexico's state-owned oil company, Petroleos Mexicanos or Pemex, to discuss ideas for using the existing service contract model to expand much needed investment in oil and gas exploration and production.

Amidst the chaos on Tuesday morning and all of our deep concerns, we did conduct the meeting. But at one point, it struck me that we might be facing a new energy paradigm. I asked whether, in light of the events that were unfolding and all of the likely implications and outcomes, there might be a fundamental re-thinking of energy policy in Mexico (where upstream activities have been constitutionally reserved to Pemex for many years). For example, I asked, could President Fox use something equivalent to our presidential executive order in the U.S. to spur investment for critical drilling and exploitation activities? I learned that Mexico would continue to move in accordance with its traditions and at the pace dictated by political realities in that country today. For that matter, I think all of us in the U.S. have learned since September 11 that energy policy here will follow its own, long-established political dynamic.

There is no question that energy security is back on the front burner, but there is also no easy solution to the conflicting opinions and divergent interests that underlie energy policy and politics, whether in the U.S., North America or worldwide. And, much like the topics I've raised with you before – our professional responsibilities as USAEE and IAEE members and the importance of energy education – we have a critical role to play in the energy policy debate. Three aspects in particular come to mind.

First, we have particular sensitivities in our own back yard with respect to our policy and trade relationships and how they relate to energy security. While both Canada and Mexico welcome U.S. investment in their energy sectors, it is clear that they also want to be equal partners. Neither country wants to be simply a low cost provider of energy for the big, perhaps oversized, Lower 48 appetite. We have two very special opportunities to address energy policy perspectives in North America, first at our upcoming North American conference in Vancouver, October 6-8, 2002 and, I am pleased to announce, at a North American conference to be held in Mexico City in

October 2003. Both the Vancouver and Mexico conferences represent a significant step for the USAEE as we broaden our affiliate base to build effective international partnerships on our continent.

Second, we have an even stronger duty to encourage unbiased and thorough economic analysis of energy policy alternatives. This is crucial for the conventional fuel markets and businesses as well as alternative fuels, for the link between commercial energy investment and preservation of environmental values and for the process of restructuring energy industries for competition. With regard to the latter, a team within USAEE is working hard to build a policy workshop in Washington, D.C., on electric power restructuring. This workshop was to be held in October but was postponed to next year, and is likely to take place sometime during the first quarter, 2002. You'll be receiving news on this event in the coming weeks.

Third, the most difficult set of issues emanating from September 11 may be those that reflect U.S. relationships with our suppliers outside of North America. I remind everyone that it was this particular arena that led to the formation of the IAEE in 1977, and also that, at the 2001 international/North American conference in Houston last April, we revived an IAEE tradition of fostering a consumer-producer dialogue. The closing session in Houston was a small step that I hope we can sustain through these critical times and the years ahead. The international conference in Aberdeen next June 26-29 and future conferences in Prague (June 4-7, 2003), Tehran (2004) and Taiwan (2005) all provide outstanding platforms to do what IAEE has, in the past, done very well – foster a neutral setting in which diverse viewpoints on the common thread of energy

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Editor's Corner

This issue of *Dialogue* brings you excellent papers by Michael Lynch, Christopher J. Jablonowski, and Jerry Taylor.

Mr. Jablonowski's article won the award for the best student paper at the 2001 USAEE/IAEE annual conference in Houston and provides an excellent analysis of oil spills and workplace safety for drilling operations, based on data from the Gulf of Mexico.

The August issue of *Dialogue* included a fine article by Sébastien Barreau and erroneously indicated that Mr. Barreau's article was the winner of the award for the best student paper at the Houston conference. Mea culpa.

Mr. Lynch's paper addresses world oil markets. Mike asked that I point out that the article was written in April, long

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President's Message (continued from page 1)

economics can be shared among professionals from businesses, universities and other research and education institutions and governments.

I have thoroughly enjoyed my tenure as USAEE president and look forward to serving as president of IAEE in 2003. The USAEE council is hard at work to develop an ongoing strategic planning process. This will be critical for all of the important tasks before us. We would enjoy hearing from you with your ideas, suggestions, and recommendations for how we, as a professional organization, can best serve our members and inject the most value added into the energy policy process.

Michelle Michot Foss

The logo for USAEE, consisting of the letters 'USAEE' in a stylized, bold, sans-serif font. The letters are arranged in a slightly upward-curving arc.

Editor's Corner (continued from page 1)

long before the atrocities of September 11. Certainly, our outlook is different since that tragic day. Mr. Taylor's article is an editorial that brings some political and economic reality to world oil markets.

Please send new articles (or suggestions for articles) and notices for publication in *Dialogue*. Include news of chapter events and appropriate press releases. Items can be sent via e-mail (proberts@reliant.com or proberts@alumni.rice.edu), by Fax (713-207-0705), or by regular mail (15709 Singapore Lane, Jersey Village TX 77040-3035). If you have questions, comments, or suggestions, I can be reached by phone at 713-207-5059.

Paul Roberts

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Nominations for 2002 USAEE Awards Requested

The USAEE is now receiving recommendations for the Senior Fellow Award and Adelman-Frankel Award recipients. Below please find a brief description of the awards and their parameters.

Adelman-Frankel Award

This award is given to an individual or organization for a unique and innovative contribution to the field of energy economics. The award may be given to someone residing outside of the U.S. Presentation is made at the annual North American Conference of the USAEE/IAEE. A plaque and \$500 stipend is given.

Senior Fellow Award

The Fellow Award is given to individuals who have exemplified distinguished service in the field of energy economics and the USAEE. Up to three recipients may receive the Fellow Award in any given year. The awards are given to the recipients at the annual North American Conference of the USAEE/IAEE. A small desk clock is given as well as life membership in the USAEE.

The USAEE Council welcomes recommendations from its membership for consideration in bestowing these awards. Please submit a 250-750 word recommendation of the person(s)/organization(s) you feel would be appropriate for receiving these awards to:

Mr. David J. DeAngelo
Mgr., Fuel Planning & Stats.
PPL Generation, LLC
RD 7 Box 7248
Bethlehem, PA 18015-9363

Recommendations may also be faxed to Mr. DeAngelo's attention at 610-774-5141 or emailed to djdeangelo@pplweb.com

*** USAEE WEBSITE UPDATED ***

If you have not been to usaee.org lately you are in for a surprise. Our new site has been rebuilt from the ground up, including a streamlined design, cleaner navigation and easier information to find. We encourage you to visit usaee.org when looking for association happenings, news, conference and chapter information.

Some of the information you will find on our site include:

- ✓ Overview/Objections of USAEE
- ✓ Council and Chapter Presidents Listing & Contacts
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We're sure that you will find our new site full of up-to-date information. Please feel free to drop USAEE Headquarters an email at usaee@usaee.org if you have any suggestions on how we can improve and expand our website.

The New Energy Crisis: Separating Threats from Hysteria

By Michael Lynch*

The past year has seen a set of events all too familiar to energy economists of a certain age, with rising prices for oil (and fuels like LNG whose prices are linked to it), natural gas prices in the US at record levels, and electricity brownouts and soaring prices in parts of the US. At the same time, political unrest in the Middle East and elsewhere suggests to some a threat of oil export cutoffs. Arguments about resource scarcity and the 'limits to growth' are once again being made, and policy-makers are under pressure to intervene to correct market failures (or market myopia, depending on the proponent and time horizon).

It is vital to realize that not only are the physical problems disruptive, there is also a threat from our interpretation of them. Markets are indeed replaying the 1970s energy crisis in many ways, particularly for those who recall that the perception of crisis preceded the 1973/74 oil price shock as rapid economic growth in the late 1960s challenged the energy industry's ability to expand capacity, causing temporary and localized supply problems, such as brownouts and gas supply curtailments, and occasional tightness in oil product markets.

Although it might seem as if resource scarcity is finally here (the 'wolf at the door' so often referred to in the alarmist literature), at root of all of these problems are two types of factors, the first of which is completely short-term and transient, and no more indicative of long-term problems than the brownouts or tight gas markets in the United States in the early 1970s.

Recent developments primarily represent an unfortunate confluence of events which are connected, but with an imperfect correlation. Warm weather and rapid economic growth raised electricity demand, stressing that system, as well as raising demand for natural gas. The collapse in oil prices reduced drilling in the US, and thus tightened gas supplies. But there are also a number of independent, short-term causal factors.

Oil markets have soared because the price crash of 1999 reduced non-OPEC investment, and OPEC cut production just as demand was beginning to soar, so that inventories became overdrawn, leaving markets tighter than anyone anticipated, and for longer. US natural gas is tight because the slower drilling in 1998/99 reduced capacity just as the addition of gas turbines, strong economic growth and warm weather meant demand was growing sharply. The electricity situation in California in particular was heavily influenced by weather and the strong economy as well, along with unusually low levels of hydro power availability, all of which was exacerbated by a poorly designed deregulation plan.

The great majority of these factors are obviously transient in nature, and do not require any major policy revisions. But there is a longer term, systemic change that could create continued difficulties, energy markets have returned to equilibrium. The world, and certainly the US, became used to having enormous surplus capacity in power generation, gas production and pipelines, and oil rigs, tankers, and refineries resulting from the price boom and demand bust in the 1970s and 1980s. Now the industry finds it harder to cope with a situation where

* Michael Lynch is Chief Energy Economist, for DRI-WEFA, Inc. He can be reached at michael.lynn@dri-wefa.com. This article originally appeared in April in Elsevier Science's *Energy Policy*.

there is no longer capacity of every sort always available to respond to any surge in demand or disruption of supply. The result has been much greater short-term price volatility than was typical over the previous two decades, even without any major politically-initiated supply disruptions.

Electricity markets in the US are perfectly symptomatic of this. The high growth rates in the 1960s and 1970s and long plant lead times, combined with return-on-capital regulation, left the industry with an enormous surplus of capacity for nearly two decades. Under such conditions, the luxury of NIMBY could easily be afforded. Unfortunately, such attitudes have become ingrained just as demand growth has eroded the surplus and consumers cannot understand why suddenly, they can no longer refuse to allow power plant construction while demanding constant and constantly growing electricity supplies.

These are important changes and suggest that energy markets will be more volatile in the near future, and in many instances, including world oil markets, have slightly higher average prices. But again, most of the difficulties now affecting world energy markets reflect transient phenomena and will be resolved primarily through market response. As Richard Gordon put it nearly a decade ago, "If we have learned anything as economists, it is that markets always clear, and they usually clear faster and at lower prices than we expect."

This does not mean that the potential for long-term problems can be ignored, because one of the greatest dangers is not from war or market failure, but from policy missteps. Many remember the gas lines of the 1970s and the two oil-price-shock induced recessions, but few recall that price controls and government misallocation of supplies helped to create the shortages or that tens of billions of dollars were misspent on expensive energies in a vain quest for energy independence and "secure" supplies. Synthetic fuels, alternative energies, and others were promoted as ways to cure market failures, but proved instead to be policy failures.

Even sadder, many of these policy mistakes were buttressed by voluminous studies from prominent experts and institutions who assured us that resources were scarce, that oil and gas were mature-even declining-industries, but that markets were too myopic to price them appropriately. The great majority of books and articles written interpreting the energy crises were not only wrong but in many cases demonstrably stupid.

Of course, it could be that these warnings have simply found their time, a point harder to refute with simple historical comparisons to previous mistaken alarms. Constantly predicting that a commodity's price will soar guarantees that sooner or later the forecaster will be correct, but this does not imply intricate understanding of the market any more than a stopped watch is functioning properly for all that it is right twice a day.

Still, the primary fault in the 1970s was poor economic analysis, of three types, all of which should have been avoidable. First, perhaps simplest, was the belief that oil was different from other commodities and demand would not be responsive to changes in price. Because historical prices had never been so high, there was no easy way to econometrically estimate demand elasticities for such price levels. And given the initially weak demand response, which included the impact of the recession, too many economists leapt to the conclusion that there was no price response. Thus, the presumption was made that-of all commodities-oil would not be price responsive when

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The New Energy Crisis (continued from page 3)

there were clearly ample opportunities for substitution with labor and capital. Needless to say, economics triumphed over the economists.

Oil and gas supply analysis proved little better, not least because of the many data problems and the difficulties that economists had in interpreting the effect of geology and geologists in understanding the role of economics in production. The initial post-1974 forecasts applied a simple price elasticity to oil supply, without recognizing the lead times necessary for non-OPEC regions to add capacity to replace previously-anticipated growth in OPEC countries, given their enormously different geological prospects.

But when supply had not responded by the late 1970s, there was a new proclivity towards interpreting all short-term and policy related constraints on oil and gas supply as reflecting unalterable physical or geological constraints. The two oil crises encouraged a Malthusian bias in estimation supply, since arguments about abundance hardly seemed valid. Beliefs that technological advances would increase the recovery of oil were derided as Pollyannaish. The result was a huge number of oil supply forecasts which predicted a near-term peak and decline for non-OPEC and non-Middle Eastern oil supply in general, and for nearly every individual country, even immature producing areas like the North Sea.

Partly as a result of these expectations for ever-increasing demand and imminently declining supply, an enormous consensus developed around the third mistake, the idea that

oil prices had to inevitably rise. Typical forecasts from the late 1970s to the mid 1980s called for prices in 2000 of \$100-200/barrel. Many economists embraced the theoretical argument that Hotelling had proven that mineral prices had to rise at the rate of interest, or at least exponentially. Computer models were reverse-engineered to demonstrate the assumed rising price path, which analysts then interpreted as scientific and objective confirmation of their expectations. The fact that mineral prices had never been demonstrated to rise in this manner was boldly explained away.

All of which convinced policy makers that the normal economics of supply and demand did not apply to energy and especially oil, and that markets were too myopic to realize the looming crisis, necessitating massive government intervention, price controls, subsidies for new supplies, crash synthetic fuel programs, etc. and even as OPEC's sales collapsed in the early 1980s, they were constantly told that their markets would soon revive, non-OPEC supply was too expensive to expand, consumers could not restrain their usage, etc. right up to the 1986 price collapse. Myopia was definitely a problem, but the analysts', not the market's.

Amazingly, not only are many of the same arguments and policy prescriptions being revived in response to the current situation, but sometimes by the same people. Marx once commented on Hegel's saying that history always repeated itself, but he added that the first time was tragedy, the second farce. Sadly, he may prove more prescient than most of the alarmist energy analysts.



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22nd USAEE/IAEE NORTH AMERICAN CONFERENCE

Hosted by:
United States Association for Energy Economics

Energy Markets in Turmoil: Making Sense Of It All

Sheraton Wall Centre Hotel – Vancouver, British Columbia, Canada
October 6-8, 2002

Conference Objective

To explore the forces driving the dramatically changing energy landscape – including price volatility, market restructuring, sustainability imperatives, policy constraints and technology

Suggested Session Themes and Topics

Sessions are currently proposed in:

Electricity markets: lessons from California

Natural gas markets: demand, supply and prices

North American energy policy: Canada, Mexico and U.S. relationships

Can fossil fuels be sustainable?

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(include a short CV when submitting your abstract)

Anyone interested in organizing a session should propose topics, motivations, and possible speakers to:

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Abstracts for papers should be 200 words or less. At least one author from an accepted paper must pay the registration fees and attend the conference to present the paper. The lead author submitting the abstract MUST include complete contact details (e.g., mailing address/phone/fax/email coordinates). All abstracts should be submitted to:

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Oil Spills, Workplace Safety, and Firm Size: Evidence from the U.S. Gulf of Mexico – Revisited

By Christopher J. Jablonowski*

Abstract

Health, safety, and environmental performance (HS&E) has always been a consideration of offshore exploration and production (E&P) operators, but since the Piper Alpha disaster in the North Sea in 1988, HS&E performance has become an industry priority. In the Gulf of Mexico (GOM), several changes are underway that are transforming the overall character of E&P operations. Shifts in the profile of operating companies (majors versus independents), deeper water operations, and more complex wells all contribute to this transformation. It is unknown what effect, if any, this transformation will have on HS&E outcomes in drilling and workover operations.

This research presents evidence to support the hypothesis that well complexity, specifically well depth and reach, increase the likelihood of HS&E incidents, while other well characteristics do not. Equally important is the evidence rejecting the hypothesis that company profiles have an effect on HS&E outcomes. The study period covers 1990-1998.

Introduction

Health, safety, and environmental performance (HS&E) has always been a consideration of offshore exploration and production (E&P) operators, but since the Piper Alpha disaster in the North Sea in 1988, HS&E performance has become an industry priority. This shift has yielded much fruit. Incident rates on mobile offshore drilling units and platforms demonstrate a declining trend over time. In 1999, the global drilling industry posted its most dramatic decline in its lost time incidence rate in recent years (DC-1, 2000). While this trend is gratifying, leaders in industry continue to devote substantial resources to accelerate this performance improvement. As declared by a major oil company's vice president of technology, "Despite excellent safety management systems... we still injure too many people and this is unacceptable" (DC-2, 2000).

As the industry evolves with new technology and expansion into previously untested basins and horizons, the challenge for industry executives and policy makers is not only to maintain this motivation and continual performance improvement, but to prepare for changes in the operating environment that are fast approaching. This challenge is widely recognized, and key industry players have organized themselves around the world to address it (Dobson, 2000). Recognition and preparation are vital, but to succeed, the facts about risk factors must be rigorously investigated so that efforts are properly allocated.

In the Gulf of Mexico (GOM), several changes are underway that are transforming the overall character of E&P operations. Shifts in the profile of operating companies (majors versus independents), deeper water operations, and more complex wells all contribute to this transformation. Industry executives and policy makers are keenly interested in the effects that these changes may have on HS&E performance

* This is edited and condensed for the *Dialogue*. An uncondensed version of this paper is available from the author. He can be reached at jabos@vicom.net

going forward. Fortunately, there exists a rich data set that can be used to test hypotheses. One such study, funded by the Minerals Management Service (MMS), by Iledare et al. (1997), served as the inspiration for the present research. Their analysis focused on *production operations*. The researchers tested for the first effect mentioned above, *i.e.* the changing profile of operating companies. But anecdotally important variables were not included, and therefore the conclusions about the effect of company profile are potentially inconclusive. The purpose of this paper is to test for the effect of company profile while controlling for these missing variables (and other control variables) to more fully explain the variables that affect HS&E outcomes. While this research is comparable in structure to Iledare et al. (1997), the focus here is on *drilling and workover operations*, and *downhole maintenance*. The study period covers 1990-1998.

Hypothesis

The offshore drilling process is an inherently dangerous activity. While random failures of equipment can cause HS&E incidents, the majority of incidents arise from unsafe procedures and worker behavior. Of course no one desires to be injured or to create environmental damage. This leads to the hypothesis of the present research, that HS&E incidents are a function of the environment created on site by the companies involved, the features of the well that increase risk and exposure, and the overall operating environment in industry. The goal is to examine which of these, if any, can explain the occurrence of HS&E incidents.

The first group of variables characterizes the companies involved in drilling operations. Both the drilling contractor and the oil company have a strong influence over HS&E performance. Some oil companies go to great expense to provide additional training prior to the start of a project, and some micromanage the drilling process to ensure safer operations.

The second group of variables that is hypothesized to influence HS&E outcomes are related to well complexity. As wells become more complex, the frequency of risky activities increases (discussed below). More generally, complexity is thought to dilute the focus on HS&E incident prevention.

Finally, the overall operating environment may influence HS&E outcomes. The drilling industry has been cyclical in the past. Rapid escalation in drilling activity brings less experienced workers into the field as drilling contractors staff previously idle rigs. Also, the regulatory environment may influence outcomes. If certain MMS Districts demonstrate less stringent enforcement, one could expect more HS&E incidents in that District, *ceteris paribus*.

Econometric Model and Variable Definitions

Based on the above hypothesis, an econometric model can be specified. In this section, I provide a general statement of the functional relationship, a description of the dependent variable and the set of independent variables, and a summary of the econometric model and its estimation.

The task is to test whether or not hypothesized variables have an impact on HS&E outcomes. The general structure of an econometric model to accomplish this task is straightforward. The dependent variable represents a discrete outcome, *i.e.* whether or not an incident occurred, and the independent variables are those hypothesized variables described below.

This type of model, where the dependent variable takes on discrete values, is commonly referred to as a qualitative response (QR) model. In the ideal formulation, there is an observation for each well drilled in the study period, and the general model is written as:

$$Y = Xb + u, \quad (1)$$

Where Y is a vector of incident observations, X is a matrix of observations of the independent variables, b is a vector of estimated parameters, and u is a vector of disturbances $\sim N(0, s^2)$.

The Dependent Variable

MMS regulations specify industry accident reporting requirements. They require lessees to notify the MMS of all serious accidents, any death or serious injury, and all fires, explosions, or blowouts connected with any activities or operations on the lease. All spills of oil or other liquid pollutants must also be reported to the MMS. These regulations also address the preparation of public accident reports and procedures used in conducting accident investigations (CFR, 1998). For this study, a HS&E incident is defined as any spill, injury, or well control incident associated with drilling or workover operations (including vessel interaction with same) and any *downhole* production operations.

The Independent Variables

Variables that characterize the companies involved in drilling operations are of interest not only in analyzing past performance as is done in this research, but also in painting a picture of the future. Most industry analysts expect the mix of operators working in the Gulf of Mexico to evolve in the coming years. For example, majors have been de-emphasizing their shallow water holdings in favor of larger deepwater prospects. While this is not the rule, it is a general trend (Furlow and DeLuca, 2000). An oil company operating a lease and the wells drilled on it has an influence over HS&E outcomes. If expectations on workers are high, if additional training is provided, and if enforcement is strong, a safety conscious workplace will result, reducing HS&E incidents. Previous research by Iledare et al. (1997) commented on the perception that *majors* (large, integrated companies) are typically better equipped to achieve these goals, although the results of that research did not support this perception. This perception will be tested again here. While the present specification proposes scope and scale binary variables comparable with Iledare et al. (1997), it adds an additional binary variable to account for downstream retail activities (gasoline sales) involving an established brand name. It seems reasonable to expect companies with valuable brand names to vigorously protect themselves from bad publicity generated by HS&E incidents such as the Piper Alpha or Exxon Valdez disasters than pure E&P companies whose only client is the pipeline. In summary, a company with a brand name has *more to lose* than its more anonymous counterpart. [See Notes for definitions of scope, scale, and brand variables].

The drilling or workover contractor is also an influential party in achieving desired HS&E outcomes. While this data is available for those wells that experienced an incident, it is not currently available from the MMS for all wells (in a tractable format), and unfortunately, is not included in the regression.

It is hypothesized that physical characteristics of the

well being drilled have an impact on HS&E outcomes. Well complexity increases the frequency of *routine activities* that are known sources of HS&E incidents (pipe handling, etc.) (DC-1, 2000). Complexity also increases the incidence of *unusual operations* such as handling stuck drill pipe, casing, and logging tools. In addition, complexity in its most general sense increases the amount of individual tasks that need to be performed by workers, potentially diluting the focus on HS&E incident prevention. As is the case in the analysis of company variables, analyzing past performance is important, but equally important is the interpretation of the results in light of current trends indicating an increase in the technical complexity of well design.

The variables selected to represent well complexity are as follows:

Depth (DEPTH): This variable refers to the total measured depth (MD) plus the true vertical depth (TVD) of the well in feet. Increased MD means longer bit runs and wiper trips, increased pipe handling, and longer casing strings and casing job duration. Drill pipe and casing handling are a major source of injuries (DC-1, 2000). TVD is a proxy for maximum bottom hole pressure. MD and TVD are highly collinear, and an index combining the two variables effectively addresses this estimation problem, although individual variable coefficients are necessarily sacrificed. The expectation of the sign of this coefficient is positive.

Reach (REACH): This variable is defined as the horizontal distance between the surface location and the bottom hole location. It is measured in degrees of longitude and latitude. As reach increases, complexity increases, therefore the expectation of the sign of this coefficient is positive.

Water Depth (WD): This variable represents the water depth measured in feet. As water depth increases, the transition to floating operations is inevitable (except in the few cases of deeper water, fixed platform rigs). More complex operations such as mooring, stationkeeping, riser management (running and handling), and deepwater well control may increase the likelihood of injury and spills. The expectation of the sign of this coefficient is positive.

Duration (DUR): This variable captures the duration of a well in days. It is important to control for this variable as increased time on a well obviously increases the raw exposure time for injuries.

Well Type (TYPE): Whether a well is an exploration or production well affects the risk profile in many ways. TYPE is a binary variable representing whether or not a well is an exploration well. While exploration wells may contain more geologic uncertainty that tends to increase the likelihood of well control incidents, production wells are not immune to uncertainty. Production well paths may be less conservative in well design based on the increased quality and quantity of data available during well planning. The expectation of the sign of this coefficient is uncertain.

In addition to characteristics of the companies and the physical attributes of wells, a third component in the set of independent variables pertains to the overall operating environment. For example, the historic cyclicity of the drilling sector may influence HS&E outcomes. As one safety executive stated it during the ramp up in the mid 1990s, "We need some

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Oil Spills (continued from page 7)

help. We're putting people out there that don't have the experience." (DC-3, 1998) The variables selected to model the operating environment are as follows:

Crew experience (CREWEXP): This variable indirectly measures drilling crew experience using the year to year percentage change in the total number of wells drilled in the Gulf of Mexico. In the contract drilling industry, crews do not sit on standby in lean years, they are dismissed and move on to new jobs. When drilling activity increases, new crews must be recruited and trained. Anecdotally, these new recruits suffer a higher risk of injury than their more experienced counterparts. Research as reported in Dobson (1999) in part supported this belief. The expectation of the sign of this coefficient is positive.

MMS District (DISTRICT): This binary variable represents the MMS District in which the well is drilled. Although consistency in inspections and enforcement across all Districts is a goal, it may not be the case in fact. This variable will test whether or not the incidence of injuries and spills are affected by a more, or less strict enforcement environment. The expectation is that this variable will be insignificant.

Technology (TIME): This is a simple control variable entered as the calendar year to control for technological change over time.

Econometric Model Development

To estimate the general model as expressed in Eq. (1), a linear probability (LP) model is inadequate, as it does not constrain predicted values to lie between 0 and 1, and it can be shown that it is inherently heteroscedastic. A more sophisticated approach is required. Standard alternatives are the *probit* and *logit* probability models.

The development of a probability model is intuitively appealing. Note that one does not observe the actual probability of an incident occurring, one only observes whether or not an incident occurred. One can define this unobservable probability as Y^* , and the model can be expressed as:

$$Y^* = Xb + u, \quad (2)$$

where the variables are as previously defined. But incident observations are made according to the rule:

$$Y_i = \begin{cases} 1, & \text{if } Y_i^* > 0 \\ 0, & \text{otherwise.} \end{cases} \quad (3)$$

Since the dependent variable is observed as either 0 or 1, it would appear to be appropriate to map $X_i b$ into a probability. One requires a function F such that:

$$\text{prob}(Y_i = 1) = F(X_i b) \quad (4)$$

An obvious choice of a function F that maps Xb into $[0,1]$ is a distribution function. If this function is the standard normal, F , one generates the normit or probit model (for the logit, the logistic distribution L is applied):

$$\text{prob}(Y_i = 1) = \Phi(X_i \beta) = \int_{-\infty}^{X_i \beta} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right) dz \quad (5)$$

It is straightforward to show that the rule in Eq. (3) combined with Eq. (5) generates a likelihood function of the form:

$$L = \prod_{i=1}^n \Phi(X_i \beta)^{Y_i} (1 - \Phi(X_i \beta))^{1-Y_i} \quad (6)$$

In the context of optimization, it is easier to maximize the log of the likelihood function:

$$\ln L = LL = \sum_{i=1}^n (Y_i * \ln(\Phi(X_i \beta)) + (1 - Y_i) * \ln(1 - \Phi(X_i \beta))). \quad (7)$$

This approach has several attractive properties. Maximization of the likelihood function yields parameter estimates that are consistent and asymptotically normal and efficient (given certain regularity conditions hold). The function is globally concave, simplifying the optimization, and it can be solved numerically.

Data Collection and Analysis

The study period for this analysis is 1990-1998, inclusive. A brief explanation of the data is important so that conclusions are viewed in the context of data quality. All of the data was collected from the MMS website (MMS-1, 2000), unless noted otherwise. The dependent variable, whether or not an incident occurred during the drilling of a particular well, is taken from MMS Accident Investigation Reports (MMS-2, 2000). Data for the independent variables originates from the MMS and industry publications. For each wellbore, observations are required of the operator of record, the technical complexity variables, and the operating environment variables.

There are two important points to make regarding the data collection and organization, especially with respect to the data aggregation issue to be discussed below. One, not all of the HS&E incidents in the MMS records are attached to a specific well, they are typically recorded by lease. In this data set, approximately one half of the drilling and workover incident reports contained a reference to the specific well, the remainder only contained the lease number. Two, if a lease had multiple operators in the study period, each was treated separately. For example, if a merger took place between *independent* A and *major* B (with different company profiles), and the designated operator changed in the MMS database, both periods of operatorship would be separately represented.

Data Aggregation

The fact that each observed incident could not be identified with a unique well required an adjustment to the model. The first attempt to address this problem was to aggregate the data by lease and by year, with independent variables being averaged for the year across wells, while other independent variables remained unaffected (except for the TYPE variable which is dropped due to the inappropriateness of averaging (a binary variable) across wells. While this aggregation permitted inclusion of all incidents, the dependent variable remained highly disproportionate, with a ratio of leases with incidents to all leases of $\pm 2\%$. Initial regressions with this data set yielded negligible explanatory power by a variety of measures. As a

final step, the data were aggregated for the entire study period by lease. This increased the proportion to $\pm 6\%$. But by aggregating across time, the CREWEXP and YEAR were dropped from the specification. The estimation proceeds with this aggregated data set.

New Variable: COUNT

Previously, the DUR variable acted as a control for increased raw exposure time on a particular well. After data aggregation, an observation is made for a particular lease for the entire study period. It is possible that one field might contain 1 well in the study period while another may contain over 100. To control for this new feature of the data, I introduce a COUNT variable that represents the number of wells drilled in each lease during the study period.

Correlation Coefficient Matrix

As a result of the data aggregation procedure, a few

favor one or the other on this data set. Both specifications were employed in initial regressions and verified this belief. As a result, only the probit results are presented here.

Results from the regression of the specification given in Eq. (8), maximizing Eq. (7) are shown in Table 2.

These results indicate three significant variables at the 5% level, each with the predicted sign: DEPTH, REACH, and COUNT. One MMS District, D4 (Lake Jackson), is nearly significant at the 10% level (under the logit, this t-statistic rises to 1.71). The SSB was used as the sole company variable in the final specification because each of the individual company variables (SCOPE, SCALE, and BRAND) was insignificant in initial regressions.

Chi-Squared and Overall Fit

General hypothesis testing for probability models is slightly different than OLS procedures. Instead of the typical F-test for all independent variables, the convention is to

**Table 1
Correlation Coefficient Matrix, All Variables**

	Y	SCOPE	SCALE	BRAND	SS	SSB	DUR	DEPTH	REACH	WD	D1	D2	D3	D4	D5	COUNT
Y	1.00															
SCOPE	0.02	1.00														
SCALE	0.04	0.74	1.00													
BRAND	0.04	0.90	0.79	1.00												
SS	0.02	1.00	0.74	0.89	1.00											
SSB	0.02	1.00	0.74	0.89	1.00	1.00										
DUR	0.03	0.19	0.20	0.21	0.19	0.19	1.00									
DEPTH	0.04	0.18	0.19	0.22	0.18	0.18	0.50	1.00								
REACH	0.06	0.03	0.07	0.05	0.03	0.03	0.08	0.02	1.00							
WD	0.01	0.33	0.33	0.37	0.33	0.33	0.31	0.26	-0.01	1.00						
D1	0.01	0.17	0.16	0.19	0.16	0.16	0.08	0.04	0.08	0.22	1.00					
D2	0.00	0.10	0.06	0.08	0.10	0.10	0.03	0.13	-0.04	0.05	-0.23	1.00				
D3	0.02	-0.01	-0.01	-0.02	-0.01	-0.01	0.03	0.09	-0.03	-0.04	-0.22	-0.19	1.00			
D4	-0.05	-0.07	-0.07	-0.06	-0.07	-0.07	-0.06	-0.16	0.01	-0.05	-0.23	-0.20	-0.19	1.00		
D5	0.01	-0.15	-0.11	-0.15	-0.15	-0.15	-0.06	-0.06	-0.01	-0.15	-0.29	-0.26	-0.24	-0.25	1.00	
COUNT	0.22	0.04	0.06	0.05	0.04	0.04	-0.01	-0.09	0.09	-0.01	0.10	0.00	0.05	-0.07	-0.05	1.00

SS = SCOPE or SCALE (binary variable)
 SSB = SCOPE or SCALE or BRAND (binary variable)
 Di = MMS District
 COUNT = Well Count

variables were lost, and a new variable was added. The final set of variables was used to construct a correlation coefficient matrix. This is shown in Table 1.

Included in the table are two new variables, SS and SSB. Due to the high correlation between the company profile variables, these binary variables were added to simplify the modeling process. SS takes on a value of 1 if either the SCOPE or SCALE variable is a 1. Similarly, SSB takes on a value of 1 if either the SCOPE or SCALE or BRAND variable is a 1. As noted the Di variables represent the MMS Districts.

Final Specification

As a result of the data analysis, subsequent aggregation process, and initial regression results, the final specification of the model is as follows:

$$Y_i = f(SSB_i, DUR_i, DEPTH_i, REACH_i, WD_i, D_i, COUNT_i), \quad (8)$$

“(i = 1...n leases)

All subsequent discussion of results refers to this specification.

Results

Whether to use a probit or logit specification is a common empirical question. The two specifications typically yield very similar results. There are no economic or other arguments to

calculate a Likelihood Ratio (LR) test: $LR = 2(L_u - L_r)$, where L_u is the log-likelihood value from the unrestricted regression and L_r is the log-likelihood value from the restricted regression. This statistic is distributed asymptotically as $\chi^2(r)$, where r equals the number of restrictions. For the base regression, the LR value of 92.4 (χ^2 critical [0.05] = 19.675) clearly rejects the null hypothesis that all coefficients are zero. Regarding the overall fit of the model, it is likely hampered by the disproportionate data set. While there are many means to qualify the overall fit of the model, I evaluated the Likelihood Ratio Index (LRI):

$LRI = 1 - (L_u / L_r)$. For the base regression, this statistic equals ± 0.08 . Additional hypothesis testing regarding independent variable sub-groups (company variables, well complexity variables, operating environment variables) are available in the complete version of this paper.

Conclusions

This research presents evidence to support the hypothesis that well complexity, specifically DEPTH and REACH, increases the probability of HS&E incidents. The reasons for this are likely the increased exposure to pipe handling and similar high risk activities, and the dilution of focus on incident prevention due to the increased number of individual tasks associated with more complex wells. It was also found that

(continued on page 10)

Table 2
Regression Results, Probit

Parameter	Estimate	Standard Error	t-statistic	P-value
C	-2.118033	.2121287	-9.984663	[.000]
SSB	.0260394	.0942392	.2763121	[.782]
DUR	.4434408E-01	.9078713	.0488440	[.961]
DEPTH	.0154875	.6581723E-02	2.353105	[.019]
REACH	.1574621	.5524873E-01	2.850058	[.004]
WD	.1252096	.4927506	.2541035	[.799]
D1	-.2318211	.1916296	-1.209735	[.226]
D2	-.1714641	.1928249	-.8892219	[.374]
D3	-.0829025	.1921361	-.4314781	[.666]
D4	-.3222668	.2022288	-1.593575	[.111]
D5	-.0429053	.1824580	-.2351518	[.814]
COUNT	.0414836	.4979688E-02	8.330571	[.000]

Number of observations = 2852.000
 Number of positive obs. = 154.0000
 Log likelihood = -553.0641

Oil Spills (continued from page 9)

water depth (WD) has not been a significant variable in influencing HS&E outcomes. Equally important is the evidence rejecting the hypothesis that company profiles have an effect on HS&E outcomes. These results can inform industry executives and policy makers of where to allocate HS&E incident prevention efforts. Also, the probit and logit specifications are consistent with each other with respect to coefficients, significance, and overall fit. Issues such as data aggregation (omitted variables), and the relatively low explanatory power of the model as elaborated above qualify these conclusions.

Future Analysis

There are at least two fronts for further analysis. First, a Poisson specification can address the effect of multiple incidents within one lease. Second, note that in this specification, it is taken as given that all incidents are reported. But this may not be the case in practice, and some incidents may go unreported for a variety of reasons. This hypothesis can be tested via *detection controlled estimation*. The interpretation of the dependent variable above changes from a vector of incidents to a vector of *reported* incidents. Two events must occur to generate an incident report. One, an incident must occur, and two, it must be reported. What we are interested in are the variables of these two underlying processes (an incident function and a reporting function). Fortunately, a likelihood function can be written to describe this joint process. Both of these fronts are being pursued by the author.

Notes:

1. The SCOPE variable is a binary variable indicating whether or not the operator is integrated into downstream activities. Companies with broader experience are likely to be more knowledgeable of HS&E and more capable of implementing successful prevention programs. For the purposes of this research, the determining factor

of scope is whether or not an operator is integrated into *refining*. There are multiple sources for this data, including The National Petroleum News' Market Facts, the Energy Information Administration's Petroleum Supply Annual, and individual company websites (mainly for foreign-owned companies).

2. The SCALE variable is structured similarly to the SCOPE variable, except that here it represents the worldwide level of drilling activity. While the *number of wells drilled* might be the most appropriate variable, a reasonable proxy which is more readily available in the literature is the quantity of hydrocarbon reserves owned by a particularly company (based on the premise that there is a direct relationship between reserves and the number of exploration and development wells drilled). Companies with more drilling operations are likely to be more sophisticated (if only by accumulated experience) and should be more aware of HS&E pitfalls and prevention. A company is deemed to capture the benefits of scale if they possess more than 1 billion bbls of liquid reserves OR greater than 5 TCF of gas reserves. This is an arbitrary split, although there appears to be a natural break in the data around these thresholds. The source for this data is the Oil and Gas Journal's *OGJ200* (and its comparable predecessors).

3. The BRAND variable is an additional binary variable indicating whether or not a company possesses retail gasoline sales. As discussed above, a company with a brand name has more to lose in the case of a HS&E catastrophe. The source for this data is the National Petroleum News' Market Facts. The companies identified as retailers in this sample typically represent over 90% of U.S. retail sales during the study period.

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Energy Markets in Turmoil: Making Sense Of It All

22nd USAEE/IAEE Annual North American Conference – October 6-8, 2002

Vancouver, British Columbia, Canada – Sheraton Wall Centre Hotel

We are pleased to announce the 22nd Annual North American Conference of the USAEE/IAEE, ***Energy Markets in Turmoil: Making Sense Of It All***, scheduled for October 6-8, 2002, in Vancouver, British Columbia at the Sheraton Wall Centre Hotel.

Please mark your calendar for this crucial conference. Some of the key selected themes and sessions for the conference are listed below. The plenary sessions will be interspersed with concurrent sessions designed to focus attention on major sub-themes. Ample time has been reserved for more in-depth discussion of the papers and their implications.

California Fallout: What Useful Lessons Can Be Learned?

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- What Went Wrong?
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Session Chair: Merete Heggelund, Norsk Hydro

- Economics of Offshore Projects
- Local Procurement for a Global Industry
- Environmental Issues

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Session Chair: Mark Jaccard, Simon Fraser University

- Decarbonating Fossil Fuels
- Sequestering Carbon
- Technology Synergies

Energy Regulation Trends and Prospects in North America

Session Chair: Michelle Foss, University of Houston

Continental Energy Policy Prospects

Session Chair: Arnold Baker, Sandia National Laboratories

Energy Security in the 21st Century

Session Chair: Robert E. Ebel, Ctr. for Strategic & Intl. Studies

Canada – U.S. Natural Gas Trade Prospects

Session Chair: Campbell Watkins

- Resource prospects
- Market considerations
- Transmission expansion

There are 24 planned concurrent sessions (note the enclosed information on Call for Papers for this meeting – the abstract cut-off date is May 1, 2002. Conference organizers are open to setting aside some concurrent sessions to cover joint submissions by a group of authors (maximum 4 per concurrent session). Given the location of the meeting in Vancouver, we anticipate an even larger draw to our concurrent sessions. The conference organizers STRONGLY SUGGEST that you get your abstract in extra early so that prompt follow-up can be given.

Vancouver, British Columbia is a wonderful and scenic/tourist place to meet. Single nights at the Sheraton Wall Centre Hotel are \$224.00 Cdn. (approximately \$150.00 U.S. dollars – a phenomenal rate) per night. Contact the Sheraton Wall Centre Hotel at 604-893-7120, to make your reservations). Conference registration fees are \$500.00 for USAEE/IAEE members and \$600.00 for non-members. Your registration fee includes two lunches, a dinner, three receptions and numerous coffee breaks, all designed to increase your opportunity for networking. Special airfares have been arranged through Air Canada. Please contact Air Canada by calling 800-361-7585 (or 514-393-9494) and reference our group #CV625181. These prices make it affordable for you to attend a conference that will keep you abreast of the issues that are now being addressed on the energy frontier.

There are many ways you and your organization may become involved with this important conference. You may wish to attend for your own professional benefit, your company may wish to become a sponsor or exhibitor at the meeting whereby it would receive broad recognition or you may wish to submit a paper to be considered as a presenter at the meeting. For further information on these opportunities, please fill out the form below and return to USAEE/IAEE Headquarters.

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Don't Worry About Energy Security

By Jerry Taylor*

"Energy security" is increasingly becoming the by-word for politicians anxious to do something on the home front to support America's war on terrorism. Apparently, the belief that reliance upon foreign oil is a dangerous Achilles heel during wartime - particularly during wartime in the Middle East - is hardwired into our collective DNA. Accordingly, Americans are anxious to sacrifice something - gas-guzzling cars, Arctic caribou, whatever - to become less dependent on foreign oil.

Don't bother. Oil imports aren't a problem and energy independence is no solution.

First, even if every drop of oil we consumed came from Oklahoma, Texas, and Alaska, a cutback in OPEC production would raise domestic oil prices just as high as if all our oil came from Saudi Arabia. That's because there are no regional markets for oil - only global markets - and regional prices invariably rise to the world price. In 1979, for instance, Great Britain was "energy independent" - all the crude oil it consumed came from the North Sea. But the oil price spike of 1979 hit Great Britain just as hard as it hit Japan, a country dependent upon imports for all its oil. No country, in short, can wall itself off from the world market.

Second, once oil is in the tanker or refinery, there is no controlling its destination. During the 1973 embargo, for instance, oil that was exported to Europe was simply resold to the United States or ended up displacing non-OPEC oil that was diverted to the U.S. market. It was no more possible for OPEC to keep its oil out of U.S. ports than it was for the United States to keep its grain out of Soviet silos several years later. Saudi oil minister Sheik Yamani conceded afterwards that the 1973 embargo "did not imply that we could reduce imports to the United States ... the world is really just one market. So the embargo was more symbolic than anything else."

Third, reliance on foreign oil imports does not effect our military capabilities. Officials at the Defense Department have repeatedly testified that the military could fight two major regional wars the size of "Operation Desert Storm" nearly simultaneously while using only one-eighth of America's current domestic oil production.

Fourth, "energy independence" - even if were technically achievable - would be positively harmful in that higher prices would be paid for energy than is necessary. After all, the United States imports Persian Gulf oil for a reason; it's significantly less expensive than domestic petroleum or non fossil fuel alternatives. Artificially limiting our access to foreign oil is to artificially limit our access to cheap oil; hardly a wise policy in the midst of a recession.

That's not to say that we shouldn't increase domestic oil production or conserve energy, just that those policies cannot be justified on the grounds of "energy security." For instance, the case for drilling in ANWR is not that it will immunize our economy from OPEC, because it can't. The real case for drilling in ANWR is twofold. First, ANWR might hold so much crude that it could reduce OPEC's share of the market, reducing the cartel's leverage over world prices. Second, oil exploration is

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simply the most productive use of some of the land within that region.

It's doubtful, however, whether drilling in ANWR would do much to bring down oil prices. Industry's best estimate is that ANWR could produce about 1 million barrels of oil per day at its peak. That's a 1.25 percent increase in global production that, all things being equal, would reduce world oil prices from \$20 per barrel to about \$18. While that's not inconsequential, it's not a cartel-breaker either.

But assume for the sake of argument that ANWR holds about 5 billion barrels of economically recoverable reserves (a reasonable estimate given what we know). That oil would have a discounted value of about \$30 billion. That's a lot of wealth we could create for an economy nosing into a recession. Is the frozen tundra above it worth that much? The only way to really know the value of something is to see how much people are willing to pay for it. While it's certainly possible that the environmentalists could raise that kind of money if they had to enter an auction for ANWR, my guess is that they couldn't and, thus, that the wilderness is less valuable than the oil.

Regardless, I don't expect that we'll have to worry about politically inspired attempts to use the "oil weapon" against the United States in the coming conflict. OPEC nations are first and foremost profit maximizers. Never once have they allowed foreign policy considerations to get in the way of the bottom line, self-serving declarations to the contrary notwithstanding.

The October 1973 embargo is a good case in point. The announced 5 percent monthly production cutbacks were canceled within a month. By December 25, OPEC agreed to a 10 percent *increase* in January production. The promise to tie oil exports to Israeli withdrawal from Palestine had a shelf life of only two months and was never heard of again.

It was economics, not politics, that explains the introduction and termination of that embargo. An increasing buildup of oil inventories throughout 1973 signaled to OPEC that production cutbacks were warranted. The tightening market of November and December signaled that greater profits could be had by expanding production. OPEC's cover story was an attempt to win a few foreign policy points for actions it would have taken anyway.

America's got a lot of things to worry about right now. But reliance upon foreign oil imports isn't one of them.

In Sympathy

On behalf of all members of the USAEE, we extend our most profound condolences to the families and friends of the victims of the attacks on New York and Washington on September 11. The senseless sacrifice of life is beyond comprehension. We ask not for whom the bell tolls; it tolls for all of us.

As a result of the attack, we became witnesses to the courage and dedication of true heroes who prevented further casualties, rescued other victims, and worked tirelessly to find additional survivors. Their example is a shining inspiration for all of us.

While we struggle to understand this attack and to bring the perpetrators of this tragic event to justice, we acknowledge the need to respect and preserve the rights of all who seek peace and justice, regardless of ethnic origin or religious belief.

**IAEE Session at the Annual
ASSA/AEA Conference**
Atlanta, GA – January 4-6, 2002

The International Association for Energy Economics will be holding its 4th Annual Session at the Allied Social Science Association meeting in Atlanta, Georgia, January 4-6, 2002. The program is listed below. We hope to see you there.

Session Title: Current Issues in Energy Economics and Energy Modeling (Q4)

Presiding: Carol Dahl, Colorado School of Mines

*Onno Kuik and Reyer Gerlagh, Institute for Environmental Studies, Vrije Universiteit, Amsterdam, The Netherlands-
The Effect of Trade Liberalisation on Carbon Leakage under the Kyoto Protocol: Experiments with GTAP-E*

Abstract

Energy-carbon-intensive industries in the Annex I countries fear that unilateral carbon abatement measures as agreed upon under the Kyoto Protocol will harm their competitiveness, endanger employment, and will not improve the environment because of carbon leakage. There have been a number of studies that analyzed the mechanisms and that have provided quantitative estimates. Of the many factors that potentially affect competitiveness of energy-intensive industries and the rate of carbon leakage, changes in import tariffs and other trade barriers have received little attention in the literature. This paper aims at filling the gap by introducing in the calculations the implementation of the Uruguay Round of multilateral trade negotiations. The estimations are made with a static, multi-sector, multi-region applied general equilibrium model (GTAP-E) that allows for inter-fuel and inter-factor substitutions. We find that under a plausible range of assumptions, the implementation of the Uruguay Round reductions of import tariffs (i) increases the rate of carbon leakage from around 14 percent-points to about 17 percent-points, but (ii) does not reduce the competitiveness of energy-intensive industries in Annex I countries.

While all reservations that one can have regarding the reliability of the numbers produced by these kinds of model calculations are valid (and wise), the analysis is intuitively appealing. Unilateral carbon reduction policies in the North are partly offset by carbon leakage to the South. The main route of carbon leakage is due to the substitution of fuels by Southern producers and households for other production factors and consumption goods. Changes in scale and composition of industry are modest in both Annex I and non-Annex I countries. Comparative advantages do not disappear overnight. While trade liberalization increases competition between countries, possibly enhancing the carbon leakage and the welfare loss in the Annex I countries (the Pollution haven hypothesis), it also leads to a further specialization towards energy and capital intensive industries in the North while the opposite occurs in the South (the Factor Endowment hypothesis). The net effect of trade liberalization under the Uruguay Round seems to be a modest increase in the rate of carbon leakage.

Peter H. Griffes, Analysis Group/Economics, San Francisco, CA-Have Economies of Vertical Integration Held up in the Electric Utility Industry?

Abstract

The structure of the electric utility industry is undergoing great change. In some regions, such as California and New England, restructuring has separated the utilities' generation and delivery functions. One feature of this transformation has been the introduction of a new type of firm to coordinate between generation and delivery on a short-term basis. The California Power Exchange and New York ISO are examples of these new entities. The concept of reformulating the industry is squarely based on the premise that any loss in economies of vertical integration would be more than offset by the reduction in costs that competition in generation would bring.

A hallmark of electricity restructuring has been the separation of the generation, coordination and delivery functions. In a vertically integrated structure, these functions are embedded within the same firm. Under the new structure, they reside in separate firms. The theory of the firm states that long-term contracts may substitute for vertical integration. It is an empirical question as to how well the new structure preserves the vertical economies found in a single firm.

Previous studies have examined the extent of economies of integration in electric utilities. They generally have found varying degrees of vertical economies. However, they all have relied on data from periods before restructuring took place. Further, they have not explicitly taken account of the role of the coordinating firms in their estimation.

In this paper, we examine the question of vertical integration in electric utilities using data from a more recent period. These data include firms that specialize in generation, coordination and delivery that were previously parts of an integrated firm. Because some regions have not yet undertaken restructuring, we include vertically integrated utilities in the analysis. In particular, we estimate the degree to which the new market structures have preserved the economies from vertical integration that are present in vertically integrated firms.

*Lynne Kiesling and Adrian Moore, Los Angeles, CA
Dynamism-Discovery and Power: An Austrian Analysis of
Electricity Deregulation, Reason Public Policy Institute and
the Northwestern University*

Abstract

To what extent do the benefits associated with markets in an Austrian framework occur in the electricity industry? The industry is historically characterized by high fixed costs and economies of scale, leading to a natural monopoly over the relevant range of demand. Electricity is not storable, and it is difficult and costly to transport over long distances. Therefore the electricity market tends to be regional and to have inelastic demand and supply, with the technical characteristics of electricity providing constraints on how elastic demand and supply could be. In addition, the recent experience in California has prompted widespread allegations that competitive markets for electricity are not technically feasible nor politically desirable.

Yet an Austrian economic analysis sheds considerable

light on the potential for competition and discovery in deregulated electricity markets, and reveals the problems in many specific policies often folded into "deregulation" proposals. Our analysis begins with the understanding that the electricity industry is evolving away from being an industry based on transactions for physical goods, and toward transactions involving exchanges of rights.

We use this information-theoretic approach to show the extent to which information matters in an industry like electricity, which is susceptible to changing cost structures with technological change, and for which information provision to and from market participants can dramatically change the price elasticities of supply and demand. We explicitly draw the connection between information sets and opportunity costs facing industry participants. Changes in the information sets of industry participants lead to substantial dynamic changes in market structure. We also use our model of the information sets of industry participants to discuss the importance of transaction costs, and how changes in transaction costs over time influence market structure (in issues such as vertical integration).

We further incorporate several intertemporal dimensions of information in the electricity industry, starting with the importance of parties contracting on their own terms (unlike the recent experience in California). A perspective on deregulation that is flexible and allows parties to determine and negotiate their own contractual terms communicates important information about expectations, opportunity costs and risk aversion.

An Austrian analysis of the electricity industry suggests that information provision is a crucial component of the benefits of deregulation. Increased information would decrease the transaction costs associated with transacting through a market process instead of an alternate institutional structure (such as internally within a firm, or a regulated utility framework). Decreasing transaction costs increase the probability of achieving more dynamically efficient outcomes that benefit consumers and engender creativity and dynamism in the electricity industry.

*Discussants: Roy Boyd, Ohio University, Athens, OH
Gale A. Boyd, Argonne National Laboratory, Chicago, IL
Sherman Folland, Oakland University, Rochester, MI*

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!!! Congratulations to the 2002 USAEE Officers & Council Members !!!

Nominations chair David DeAngelo and committee members John Jimison, Mary Novak, Sam Van Vactor and Mine Yucel are pleased to announce the following elected 2002 USAEE Officers & Council Members:

President-Elect

Adam E. Sieminski

VP, Conferences

John C. Felmy

VP, Chapter Liaison

Clifford A. Mangano

Secretary-Treasurer

Owumi Iledare

Council Members

Shirley J. Neff

Mark A. Schwartz

Other Officers/Council members during 2002 are Arnold B. Baker, 2001 USAEE President, Michelle Michot Foss, USAEE Past President and Council members Hung-po Chao and Stephen R. Connors.

Congratulations to this new group of USAEE leadership!

New Members of USAEE

The follow individuals recently joined the USAEE in the period March 1, 2001 to June 30, 2001. Welcome!!

John L Ballentine IV

ID3 Energy Group

David T Barker

So Calgas Co

Carolyn A Berry

NERA

Michael J Cheetham

National Research Council

John M Cogburn

Georgia Public Service Commission

Karen L P Elliott

Energy and Environmental Research

Ron Erd

Mirant Americas Energy

Galip Feyzioğlu

PUCO

Karen Fisher-Vanden

Dartmouth College

Leonardo Giacchino

National Economic Research Assocs

Barclay W Gibbs

Antares Group

George Given

Henwood Energy Services Inc

A J Goulding**London Economics****Edgard Habib**

Chevron Corporation

Donald Hanson

Argonne National Laboratory

Scott Hassell

RAND

Ed Heberlein

Accenture

Mikkal Herberg

Asia-Pacific Energy Environment

Michael Hester**Derek Holmes**

Cargill Inc

Blake Johnson

Vivecon Corp

Michael P Kagan

AES NewEnergy

Peter Kobos

Rensselaer Polytechnic Institute

Alexander Kofitse

MA Department of Telecommunications

Maria V Lauve

Rutgers University

Jason Loehde

Aquila Inc

Michael Loenen

ACES Power Marketing

Maureen S Lorenzetti

Oil & Gas Journal

Chuck Martie

Governor's Office of Policy Res

James I Miller

Rice University of Economics Dept

Reid Miller

NCASI

Juan-Pablo Montero

MIT

Martha G Moore

American Chemistry Council

Christopher P Moyes

Moyes & Co Inc

Clayton A Newton

Aquila

Daniel J O'Connor

ISO-New England c/o System Planning

Hidefumi Ohata

Tokyo Gas Co Ltd

Hethie S Parmesano

Natl Economic Research Associates

Colin Pettorsson**Johannes Pfeifberger**

The Brattle Group

Randy Piper

Infinity Energy Group

Barry Posner

Penn State University

Donald Prible

Yaser Qasem

Rama Chandra S Reddy

The World Bank

Scott Reeves

Advanced Resources International

Gil Rodgers

Cambridge Energy Research Associate

Jean W Rosenthal**Charles G Rossman**

Southern Company

Jay Saunders

Deutsche Banc Alex Brown

Gerald B Sheble

Iowa State University

Tina M Sivinski

EDS

Katherine Spector

Energy Intelligence Group

Howard Stone

Capital Management Associates Inc

Linda L Sutliff**Peter Vandoren**

Cato Institute

Thomas E Wallin

Energy Intelligence Group

Robin Jane Walther**Larry Weick**

Syntroleum Corp

USAEE Student Scholarship Fund: A Call for Support

Started in 1997 at the San Francisco North American Conference, the USAEE is proud to continue its student scholarship fund. Funds are used to cover the cost of registration fees for students attending the annual conference of the USAEE/IAEE. Students must submit a written application and letter from their student advisor requesting that funds be granted. At the Houston Conference, thirteen students qualified to have their conference registration fees waived in an effort to share our conference experience, the field of energy economics and networking opportunities with other students. Further, inviting student participation at our conferences is one of the best mechanisms for recruiting new members to the USAEE.

The student scholarship fund has been generously provided by the support of the following organizations/individuals:

Conoco, Inc.
Michael Lynch

Joe Dukert
Andre Plourde

Hirokatsu Sugiyama
Exxon Mobil Corporation

Recognizing the need for interested and qualified graduates, many funding organizations view the program as supporting education as well as recruitment. The USAEE has started its campaign for scholarship funds for the 2002 North American meeting in Vancouver, British Columbia, Canada, October 6-9. Contributions have ranged from \$50 to \$2500. If you would like to receive information on how your or your company can become a supporter of this program, please contact Dave Williams, USAEE Executive Director at (p) 216-464-2785, (f) 216-464-2768, or usae@usae.org

British Institute for Energy Economics
International Association for Energy Economics

25th International Conference

Exhibition and Conference Centre, Aberdeen, Scotland

June 27th – 29th, 2002

Innovation and Maturity in Energy Markets: Experience and Prospects

***** Call for Papers – Program & Social Activities *****

On behalf of the British Institute for Energy Economics it is our pleasure to invite you to Scotland for the 25th International Conference of the IAEE. Please mark your calendar for this important event, the silver jubilee conference, and the first time that the IAEE has come to Scotland.

The conference will bring together a remarkable set of speakers for its plenary sessions. However, the centrepieces of the conference will be its concurrent paper sessions which will form the heart of the meeting. This is the first call for papers for these sessions. Submissions are welcome in all areas of energy economics, but those which lie within the main themes are particularly welcome. The conference has five main themes all of which are important globally:

Renewable Energy: The pace of development of all forms of renewables. Barriers to development. Technical progress, reduction of costs and government incentives.

The Role of Government: Government regulation in all stages of the energy industries. The impact of environmental policies on energy. Taxation of energy. The evolving geopolitics of energy.

Natural Gas: The problems of gas development at global and regional levels. The determination of prices. The reserve position. The place of natural gas within the power generation sector. Security of Supply.

The Oil Industry: Technology and the resource base. The development of the offshore industry. Taxation. New frontiers. The Future of the North Sea Industry. Oil price developments and market mechanisms.

IT and the Energy Sector: How has the impact of IT developed, or is the revolution over? The place of e-commerce. The provision of information by governments and its role. IT and market transparency. IT and its impact on costs.

Abstracts should be between 200 and 1000 words. Details should include the title of the paper, name(s) and address(es) of author(s), telephone, fax and email as well as a short CV. At least one author from an accepted paper must pay the registration fees and attend the conference to present the paper. All abstracts and inquiries should be submitted to: Professor Alex Kemp, University of Aberdeen, Department of Economics, Edward Wright Building, Dunbar Street, Old Aberdeen, AB24 3QY. Tel: 44 (0) 1224 272168, Fax: 44 (0) 1224 272181, email: a.g.kemp@abdn.ac.uk.

The deadline for submission of abstracts is January 31st 2002.

Visit the IAEE website at <http://www.iaee.org> for the latest information or visit the conference website at www.abdn.ac.uk/iaee

Important Notice: Young Energy Economists Session

One set of concurrent paper sessions will be given entirely to authors under the age of 35. In addition, a prize of \$500 will be awarded for the best paper given in this session, plus the refund of the conference registration fees. Please indicate on the abstract if any author is under 35 years old.

Brief Program Overview

Session Topics Under Development Include:

Towards a New Global Energy Policy
The North Sea in a Global Context
Middle East Energy Issues
U.S. Regulation Matters

The Perils of Forecasting
Privatisation
25 Years of Energy Policy:
A Tour by Past IAEE Presidents

Preliminary List of Distinguished Speakers Include:

Malcolm Brinded, Chairman, Shell UK
Gerald Doucet, World Energy Council
Herman Franssen, Petroleum Economics Limited
Alex Kemp, University of Aberdeen
Paul Stevens, University of Dundee
Brian Wilson, UK Minister of Oil
Brett Polman, Texas PUC
Donald Santa, Troutman Sanders

Peter Davies, BP
Michelle Foss, University of Houston
Tony Hayward, BP
Lord Nigel Lawson
David Newberry, University of Cambridge
Shirley Neff, U.S. Senate
Vicky Bailey, US Department of Energy

Social Delights

The Conference will be held in Aberdeen, Scotland, the “Oil Capital of Europe” and operations centre for North Sea oil. Major and smaller oil companies and service companies have prominent presences in the city. The timing of the conference ensures that attendees can enjoy daylight for nearly 24 hours per day. June is also generally the warmest month of the year. Aberdeen has many attractions including an ancient University. It is also the ready gateway to magnificent scenery, many castles, ancient and modern, malt whisky distilleries and golf courses.

The welcome reception on the evening of 26 June will be held in the Elphinstone Hall at the ancient University of Aberdeen. This will give delegates an opportunity to see the campus, including the unique King’s College chapel.

On the evening of 27 June the gala dinner will be held at Ardoe House, a magnificent 19th century Baronial Mansion with modern ballroom facilities. It is located in beautiful surroundings beside the river Dee about 4 miles from the city.

On the evening of the 28th there will be a Scottish evening featuring a reception with Scottish food and entertainment.

Cultural Programme

A variety of cultural events will be available. Aberdeen itself has an art gallery and museums (including a Maritime Museum featuring the history of North Sea oil). Within easy travelling distance are many malt whisky distilleries. It is possible to go on a “whisky trail” involving several distilleries within a relatively short time period. The North-East of Scotland is also richly endowed with many castles, some of which date from the Middle Ages. Some are now ruined, but many are in use, including several run by the National Trust for Scotland. It is possible to visit more than one in a day, for example, Balmoral Castle, the Scottish home of the Royal Family, is within easy travelling distance. Aberdeen and the surrounding areas are also very well-endowed with golf courses, including several championship ones, generally open to visitors. The very long hours of daylight in June greatly increase the opportunities available to visitors.

Technical Tours

A variety of technical visits will be available. In Aberdeen itself, beside the Conference Centre, there is a drilling rig used for experimental work. Approximately 30 miles North of Aberdeen there is the recently expanded Peterhead Power Station with a capacity of around 1,500MW. A little further north is the large St. Fergus Gas Terminal. To the south of Edinburgh is the Torness nuclear power station.

Getting to Aberdeen

Aberdeen is served with 11 daily direct flights from London (Heathrow and Gatwick). There are also several direct flights from London Luton (Easyjet), London City airport, Manchester, Newcastle, Birmingham, Leeds/Bradford, Humberside, Norwich and Glasgow. There are direct international flights from Amsterdam and Stavanger. A special deal has been struck with KLM/Northwest for conference delegates. The airport is 20 minutes drive time to the City Centre or the Conference Centre. There are direct train links from London and many other cities in the UK to Aberdeen.

Queries:

Professor Alex Kemp
Department of Economics
University of Aberdeen
Edward Wright Building
Dunbar Street, Old Aberdeen
AB24 3QY Scotland, UK

Phone: 44-1224-272168
Fax: 44-1224-272181
Email: a.g.kemp@abdn.ac.uk

**** CONFERENCE SPONSORS TO-DATE:** Shell, BP Amoco, the UK Department of Trade and Industry and the Aberdeen City Council**

Broaden Your Professional Horizons

Join the

International Association for Energy Economics (IAEE)

In today's economy you need to keep up-to-date on energy policy and developments. To be ahead of the others, you need timely, relevant material on current energy thought and comment, on data, trends and key policy issues. You need a network of professional individuals that specialize in the field of energy economics so that you may have access to their valuable ideas, opinions and services. Membership in the IAEE does just this, keeps you abreast of current energy related issues and broadens your professional outlook.

The IAEE currently meets the professional needs of over 3300 energy economists in many areas: private industry, non-profit and trade organizations, consulting, government and academe. Below is a listing of the publications and services the Association offers its membership.

• **Professional Journal:** The Energy Journal is the Association's distinguished quarterly publication published by the Energy Economics Education Foundation, the IAEE's educational affiliate. The journal contains articles on a wide range of energy economic issues, as well as book reviews, notes and special notices to members. Topics regularly addressed include the following:

Alternative Transportation Fuels	Hydrocarbons Issues
Conservation of Energy	International Energy Issues
Electricity and Coal	Markets for Crude Oil
Energy & Economic Development	Natural Gas Topics
Energy Management	Nuclear Power Issues
Energy Policy Issues	Renewable Energy Issues
Environmental Issues & Concerns	Forecasting Techniques

• **Newsletter:** The IAEE Newsletter, published four times a year, announces coming events, such as conferences and workshops; gives detail of IAEE international affiliate activities; and provides special reports and information on an international basis. The newsletter also contains articles on a wide range of energy economics issues, as well as notes and special notices of interest to members.

• **Directory:** The Annual Membership Directory lists members around the world, their affiliation, areas of specialization, address and telephone/fax numbers. A most valuable networking resource.

• **Conferences:** IAEE Conferences attract delegates who represent some of the most influential government, corporate and academic energy decision-making institutions. Conference programs address critical issues of vital concern and importance to governments and industry and provide a forum where policy issues can be presented, considered and discussed at both formal sessions and informal social functions. Major conferences held each year include the North American Conference and the International Conference. IAEE members attend a reduced rates.

• **Proceedings:** IAEE Conferences generate valuable proceedings which are available to members at reduced rates.

To join the IAEE and avail yourself of our outstanding publications and services please clip and complete the application below and send it with your check, payable to the IAEE, in U.S. dollars, drawn on a U.S. bank to: International Association for Energy Economics, 28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122. Phone: 216-464-5365.

____ Yes, I wish to become a member of the International Association for Energy Economics. My check for \$60.00 is enclosed to cover regular individual membership for twelve months from the end of the month in which my payment is received. I understand that I will receive all of the above publications and announcements to all IAEE sponsored meetings.

PLEASE TYPE or PRINT

Name: _____

Position: _____

Organization: _____

Address: _____

Address: _____

City/State/Zip/Country: _____

Mail to: IAEE, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122 USA

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USAEE BEST STUDENT PAPER AWARD GUIDELINES

USAEE is pleased to once again offer an award for the Best Student Paper on energy economics. The award will consist of a \$1000.00 cash prize plus waiver of conference registration fees at the Vancouver 2002 USAEE/IAEE North American Conference, October 6-8. To be considered for the USAEE Best Student Paper Award please follow the below guidelines.

- Student must be a member of USAEE or IAEE in good standing.
- Submit COMPLETE paper by **May 1, 2002** to USAEE Headquarters.
- Paper MUST be original work by the student (at least 50% of work completed by the student seeking award).
- Submit a letter stating that you are a full-time student and are not employed full-time. The letter should briefly describe your energy interests and tell what you hope to accomplish by attending the conference. The letter should also provide the name and contact information of your main faculty supervisor or your department chair. Also, include a copy of your student identification card.
- Submit a brief letter from a faculty member, preferably your main faculty supervisor, indicating your research interests, the nature of your academic program, and your academic progress. The faculty member should state whether he or she recommends that you be awarded the scholarship funds.

Complete applications should be submitted to the USAEE/IAEE Headquarters office no later than May 1, 2002 for consideration. Please mail to:

David L. Williams, Executive Director, USAEE Headquarters
28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122

NOTE: The recipient of the \$1000.00 cash prize will receive notification of this award and be presented the award at the Vancouver USAEE/IAEE North American Conference. This individual will also receive a complimentary registration to attend the meeting. Please note that all travel (ground/air, etc.) and hotel accommodations, meal costs in addition to conference-provided meals, etc., will be the responsibility of the award recipient.

For further questions regarding USAEE's Best Paper Award, please do not hesitate to contact David Williams at 216-464-2785 or via e-mail at: usaee@usaee.org

VANCOUVER USAEE/IAEE CONFERENCE STUDENT SCHOLARSHIPS AVAILABLE

USAEE is offering a limited number of student scholarships to the 22nd USAEE/IAEE North American Conference. Any student applying to receive scholarship funds should:

1) Submit a letter stating that you are a full-time student and are not employed full-time. The letter should briefly describe your energy interests and tell what you hope to accomplish by attending the conference. The letter should also provide the name and contact information for your main faculty supervisor or your department chair, and should include a copy of your student identification card.

2) Submit a brief letter from a faculty member, preferably your main faculty supervisor, indicating your research interests, the nature of your academic program, and your academic progress. The faculty member should state whether he or she recommends that you be awarded the scholarship funds.

USAEE scholarship funds will be used only to cover conference registration fees for the Vancouver USAEE/IAEE North American Conference. All travel (air/ground, etc.) and hotel accommodations, meal costs in addition to conference-provided meals, etc. will be the responsibility of each individual recipient of scholarship funds.

Completed applications should be submitted to USAEE Headquarters office no later than September 25, 2002 for consideration. Please mail to: David L. Williams, Executive Director, USAEE, 28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122.

Students who do not wish to apply for scholarship funds may also attend the conference at the reduced student registration fee. Please respond to item #1 above to qualify for this special reduced registration rate. Please note that USAEE reserves the right to verify student status in accepting reduced registration fees.

If you have any further questions regarding USAEE's scholarship program, please do not hesitate to contact David Williams, USAEE Executive Director at 216-464-2785 or via e-mail at: usaee@usaee.org

Publications

Thermal Use of the Underground – Ground Source Heat Pump Systems, VDI Verein Deutscher Ingenieure, VDI Gesellschaft Energietechnik, (September 01). Price: 123,00DM. Contact: Beuth Verlag GmbH, D-10772 Berlin, Germany. Phone: 44-30-2601-2759. Fax: 49-30-2601-1263. Email: postmaster@beuth.de

European Energy Industry Business Strategies – Deregulation and the Future of the Electricity Supply Industry in Europe, Professor A. Midttun, Editor (2001). Price: NLG240(euro 108.91)/US\$125.50. Contact: Elsevier Science, PO Box 945, New York, NY 10159 USA. Phone: 212-633-3730. Fax: 212-633-3680. Email: usinfo-f@elsevier.com

World Energy Assessment: Energy and the Challenge of Sustainability. 516 pages. Price: \$65.00. Contact: United Nations Publications, Room DC2-0853, Dept. D150, New York, NY 10017. Phone: 800-253-9646. Fax: 212-963-3489. Email: publications@un.org

Commercialization of Renewable Energy Technologies for Sustainable Development. 200 pages. Price: \$35.00. Contact: United Nations Publications, Room DC2-0853, Dept. D150, New York, NY 10017. Phone: 800-253-9646. Fax: 212-963-3489. Email: publications@un.org

Reform and Restructuring of the Gas Industry in Economies in Transition. 120 pages. Price \$25.00. Contact: United Nations Publications, Room DC2-0853, Dept. D150, New York, NY 10017. Phone: 800-253-9646. Fax: 212-963-3489. Email: publications@un.org

Environmental Management in Oil and Gas Exploration Production: An Overview of Issues and Management Approaches. 72 pages. Price: \$40.00. Contact: United Nations Publications, Room DC2-0853, Dept. D150, New York, NY 10017. Phone: 800-253-9646. Fax: 212-963-3489. Email: publications@un.org

First Europe-Latin American Dialogue on Promotion of Energy Efficiency. 84 pages. Price: \$10.00. Contact: United Nations Publications, Room DC2-0853, Dept. D150, New York, NY 10017. Phone: 800-253-9646. Fax: 212-963-3489. Email: publications@un.org

Calendar

6-7 November 2001, Empire Energy & Environmental Exposition at Empire State Plaza Convention Center. Contact: Donna Way, Communications and Program Director, EBA/NYS, 126 State St, 3rd Floor, Albany, NY, 12207, USA. Phone: 518-432-6400 x224. Fax: 518-432-1383 Email: info@eba-nys.org URL: www.eba-nys.org

8-8 November 2001, Managing Weather Risk with Weather Derivatives at Houston, TX USA. Contact: John Adamiak, PGS Energy Training, Houston, Texas, USA. Phone: 412-279-9298 URL: www.pgseenergy.com/schedule.html

15-16 November 2001, Power Project Finance 2001: Winning Strategies for Structuring the Deal at San Francisco, California. Contact: Institute for International Research, 708 Third Avenue, 4th Floor, New York, NY, 10017-4103, USA. Phone: 888-670-8200. Fax: 941-365-2507 Email: register@iirusa.com URL: www.iirusa.com/powerprojectfinance/

3-5 December 2001, Gambling with the Future Outsourcing the Utility Enterprise at Houston, Texas, US. Contact: Kim Good, T&D World Outsourcing Conference, 9800 Metcalf Ave, Overland Park, KS, 66212, USA. Phone: 913-967-1865. Fax: 913-967-1898 Email: kgood@intertec.com

14-25 January 2002, 11th International Training Program on Utility Regulation and Strategy at Gainesville, FL. Contact: Pascale Parker, Program Manager, PURC, University of Florida, 205 Matherly Hall, Gainesville, FL, 32611, USA. Phone: 352-392-3655. Fax: 352-392-5090 Email: purcecon@dale.cba.ufl.edu URL: www.purc.org

February 27, 2002 - March 1, 2002, DistributTECH 2002 at Miami Beach, Florida. Contact: Jennifer Lindsey, Conference Manager, PennWell. Phone: 918-832-9313 Email: jenniferL@pennwell.com URL: www.pennwell.com

19-21 March 2002, Electric Power 2002, St. Louis, MO, USA at America's Center. Contact: The TradeFair Group Inc, 1220 Blalock Road, Suite 310, Houston, Texas, 77055, USA. Fax: 713-463-9997 URL: www.electricpowerexpo.com

13-15 May 2002, Asia's Energy Future: Economic Growth and Security at Shangri-La Hotel, Singapore. Contact: Robert W. Radtke, VP, Policy and Business Programs, Asia Society, 725 Park Avenue, New York, NY, 10021-5088, USA. Phone: 212-288-6400. Fax: 212-517-8315 URL: www.asiasociety.org

11-13 June 2002, Power-Gen Europe at Milan, Italy. Contact: PennWell Corporation, POWER-GEN Europe 2002, PO Box 94732, Tulsa, OK, 74194, USA. Phone: 1-918-831-9160. Fax: 1-918-831-9161 Email: powergeneurope@pennwell.com URL: www.powergeneurope.com

27-29 June 2002, 25th IAEE International Conference: «Innovation and Maturity in Energy Markets: Experience and Prospects» at Aberdeen, Scotland. Contact: David Williams, Executive Director, IAEE, 28790 Chagrin Blvd., Suite 350, Cleveland, Ohio, 44122, USA. Phone: 216-464-5365. Fax: 216-464-2737 Email: iaee@iaee.org URL: www.iaee.org

6-8 October 2002, 22nd USAEE/IAEE Annual North American Conference: «Energy Markets in Turmoil: Making Sense Of It All» at Vancouver, BC, Canada. Contact: David Williams, Executive Director, USAEE, 28790 Chagrin Blvd., Suite 350, Cleveland, Ohio, 44122, USA. Phone: 216-464-2785. Fax: 216-464-2768 Email: usaee@usaee.org URL: www.iaee.org

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