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You may be interested in the attached article by Cheryl Trench, Executive Vice President of the Foundation and recently published in the Oxford Energy Forum. Please call if you have any questions on this or other issues.

Oxford ENERGY FORUM

A QUARTERLY JOURNAL FOR DEBATING ENERGY ISSUES AND POLICIES

Issue 18 August 1994

'The decline in US crude oil production started 25 years ago . . . for the next ten years, the downward trend is widely expected to continue.' With these words Cheryl Trench opens the debate on the future of oil (and, to a lesser extent, gas) in the USA.

In broad terms, her fellow contributors are in agreement with her, though the approach and selected emphases differ from article to article. They are also in agreement regarding two developments which may well prove vital to future oil (and gas) industry development: technology and the small, independent company. Bernard Picchi details the particularly promising exploration and development technologies and then outlines the need for future profitability to streamline organizations and to turn over operatorship from big companies to more nimble independent firms. This latter point is explored in detail by Scott Espenshade in his decidedly upbeat article on independent producers. He presents an agenda of proposals for financial relief to assist the independents in their search for and production of oil and gas, and emphasizes that 'Hundreds of thousands of jobs and the nation's future depend on the US government moving in the right direction.' As Cheryl Trench says on this latter point, regardless of concerns for national security and imports, the health of the upstream oil sector is an appropriate matter for national concern. Regarding imports we are reminded that in comparison to Europe and countries like Japan and South Korea, US oil dependency is the lowest of the major consuming nations. And just in case we lose sight of reality in the face of the vociferous debate about oil imports and national security, Picchi reminds us that energy is more than oil alone; there are winners and losers in terms of market share between oil, coal, gas and nuclear.

In looking to the future of the electricity industry, Alex Henney presents a wide ranging survey of the evolution of competitive power markets, from the USA and Argentina, through Europe and onto New Zealand and Australia. He sees liberalization of electricity as part of a general trend toward deregulation that characterized much of the western world during the 1980s and looks to what the future might hold. Following on from this, Francis McGowan examines the internationalization of the industry, the new trade networks of alliances, cross-shareholdings and foreign

CONTENTS

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investments. He points to the early international character of the electricity business, which only later succumbed to nationalization. That nationalization model is now being challenged in both developed and developing countries, sometimes successfully, sometimes unsuccessfully. In context of the on-going deregulation of electricity generation, Jim Skea and Steve Sorrell look at the growing interest in using economic instruments to regulate pollution from the industry. In particular they explore the conditions under which emissions trading could succeed, and show that while liberalization facilitates such trading, the trading itself may induce greater competition. All underline the increasingly global canvas of the electricity business.

The Future of US Oil and Gas

Cheryl Trench shows that the trend in US oil production is not new and asks should the policies be?

The decline in US crude oil production started 25 years ago. The start-up of production from the Alaskan North Slope's supergiant Sadlerochit reservoir stemmed the decline for a few years, but its underlying direction continued, and the production curve has again turned downward. Further advances in technology will be a key to the shape of the production curve in the long term. But for the next ten years, the downward trend is widely expected to continue.

The history of US production illuminates the path to the current situation. The USA, uniquely, provides private owners with the right to contract for resource extraction from their property, and to take benefits in the form of royalties. Hence, the entrepreneurial spirit of both landowners and explorationists led to it becoming the most densely explored nation in the world. The petroleum industry developed earlier there than in other nations. In 1918 the USA, then the single largest producer, was providing 70 per cent of the world's supply. It was still providing half in the early 1950s, and remained the first-ranked producer into the 1970s. As a consequence, many of the USA's largest fields in the Lower-48 States have produced most of their expected ultimate recovery. East Texas, for instance, has produced 5.1 billion barrels, and has remaining reserves of some 200 million barrels; it has thus produced 96 per cent of the 'ultimate recovery.' Midway-Sunset has produced 77 per cent, Wilmington 86 per cent of its ultimate recovery.

Figure 1 contains no surprise, then, as it demonstrates the decline in US Lower-48 production over the decades of the 1970s and 1980s. In the early 1980s, the industry responded to the huge price increases of 1979 and 1980 with a frenzy of drilling. Infill drilling to enhance production from existing fields kept Lower-48 output essentially unchanged in the first half of the decade. The price break of 1986 changed all that.

Again, the historical context contributes to the story. The price increases of 1979 and 1980 found a worldwide industry poised for action. The expectation of inexorably rising prices prevailed in the latter half of the 1970s among policymakers, oil companies, drilling contractors and oilfield service companies. While price controls in the USA kept prices below world levels, they were high enough to encourage increased drilling and rig construction. The easing of price controls to allow US discoveries to capture world prices coincided with the soaring prices of early 1979.

Thus we see in Figure 2 that the US drilling effort climbed rapidly in the late 1970s, with virtually full utilization

Figure 1 Crude Oil Production and Price, 1960–93

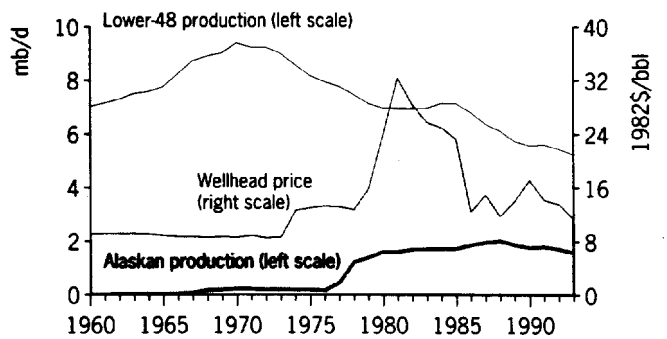
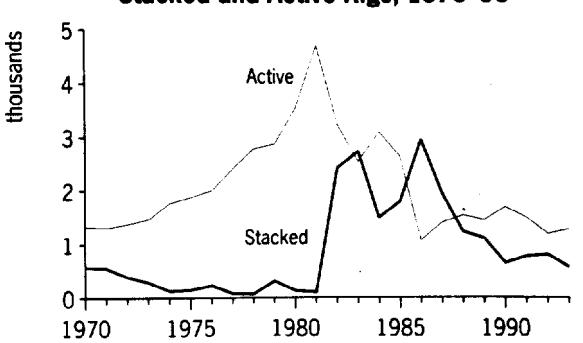


Figure 2 Rotary Rig Census
Stacked and Active Rigs, 1970–93



Source: Reed Tool Company

of available rigs. When oil prices were fully decontrolled in 1981, flowing production could also be priced at world levels, thus encouraging infill or development drilling. By this time, it appeared that any rig would find employment. This notion, however, was short-lived: witness the burgeoning pile of idle rigs in the early 1980s.

Figure 2 is also telling, however, in its suggestion of a possible response to a future price increase. In the first half of the 1980s, drilling nearly doubled in comparison to the previous five years, and development drilling accounted for more than its share of the increment. This infill drilling took advantage of the inventory of discoveries found by the earlier exploratory drilling. Proved reserves in the Lower-48, however, only remained about flat, for all the drilling effort, and have done so since. Such an immediate production response to a drilling surge is not possible today, even in the face of sharply increased prices, for the ready inventory of undeveloped properties does not currently exist. Therefore, the exploratory phase, a multi-year endeavour, would be the necessary precursor to the kind of development drilling that might stabilize Lower-48 production, even temporarily. A question exists, furthermore, as to how prolific such a renewed exploratory effort might be, especially while restrictions on access to frontier areas limit the likelihood of a mega-find.

The forecast of continuing declines in US production, like the ongoing declines themselves, is not new, as illustrated by the Energy Information Administration's (EIA) projections made in selected years over the last decade. Even before the 1986 price break, the EIA and others generally expected declines in Lower-48 production levels, as shown in Figure 3. These declines have been forecast in spite of the increases projected in the accompanying price paths.

For most of the selected years, the downward trend slows as the forecast period rolls forward. However, in the last few years the curve has retained a similar shape but ratcheted downward to a new, lower level. The *Annual Energy Outlook 1994*, with the lowest forecast at 4.3 million b/d in 2005, down from 5.5 million b/d in 1992, also shows a slight increase between 2005 and 2010, a result of enhanced oil recovery and technological advances in the period beyond the chart's plot.

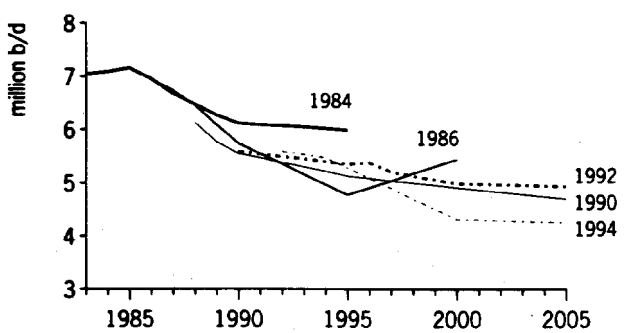
The slowing of the EIA's forecast decline between 2000 and 2005 comes from a variety of producing regions (Gulf Coast onshore, Gulf Coast offshore, the Midcontinent), and includes a limited turnaround in some onshore areas, and in offshore operations. Nevertheless, these do not outweigh the more constant downward slope of crude production in the predominant Southwest region, which falls from more than 1.4 million b/d in 1990 to 1.2 million b/d in 2000 and about 1.0 million b/d in 2010.

Increasing oil demand and falling oil production will lead inevitably to higher imports. Whether these imports represent a threat to national security is at the heart of a vociferous and long-lived debate in the USA, in contrast to the reaction of other nations to their higher dependency. At 43 per cent, the oil import dependency of the USA is the lowest of the major oil consuming nations (see Figure 4). In Europe, the importers (i.e. all but producers UK and Norway) obtain 90 per cent and more of their oil supplies from imports. Japan's import dependency is 100 per cent for practical purposes, as is South Korea's.

Calls to stem the tide of oil imports on national security grounds are based on the need to protect the USA from the impact of oil supply interruptions. The premise inappropriately assumes that the country can isolate itself from world markets. In this age of free and global markets, an interruption is evidenced as a price increase, not an actual physical shortage. The price increase affects all world markets, not just the ones most dependent on the interrupted supply. For example, during the Gulf conflict, US dependency on the interrupted volumes, the exports of Iraq and Kuwait, was 4 per cent – a small share of Europe's 11 per cent and Japan's 16 per cent. Yet the necessary redistribution of supplies and the demand adjustment brought price increases in the USA as well as abroad. Thus, the harm to the economy from an interruption comes from the price dislocation – the signal that brings about the market realignment – and the US economy will receive and respond to that signal whether it is 50 per cent dependent or 25 per cent dependent on imports to supply its oil.

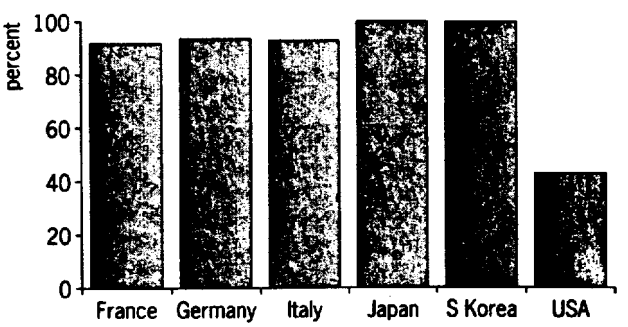
The Strategic Petroleum Reserve (SPR) is the one mechanism that can dampen

Figure 3 Lower-48 Production Forecasts



Source: Energy Information Administration, *Annual Energy Outlook*

Figure 4 Net Import Dependency, 1993



the price signal in the event of a supply disruption. The SPR is the only reliable incremental US supply. While oil-exporting countries may have surplus productive capacity, it is a sovereign decision to make additional supplies available. During the Gulf conflict, Saudi Arabia, Venezuela and others increased their production to make up for the lost Iraq and Kuwait exports. There was no requirement that they do so, however. The USA produces at full capacity, and will continue to do. Thus, even an ambitious new regime to foster production would not provide incremental US volumes during a supply disruption. In contrast, the SPR, fully under US government control, is designed for just this purpose.

Although the limited national security questions presented by increasing oil imports are not answered by policy measures that will constrain imports with the intention of increasing domestic production, the health of the upstream oil sector is an appropriate matter of national concern. The exploration and production segment of the petroleum industry is intertwined with regional economies across the country.

A number of analysts have recently focused on the development of regulatory or tax mechanisms that would encourage upstream activities with targeted incentives. The Department of Energy's *Domestic Natural Gas and Oil Initiative*, published in 1993, pledged to examine a number of upstream technological issues, and to re-examine the tax treatment of geological and geophysical expenditures. The Secretary of Energy requested that the National Petroleum Council (an advisory group composed of executives from the oil and gas industry and organizations with related interests) explore the economics of marginal production and the needs of its producers. Among the proposals under discussion are not only the immediate deduction of geological and geophysical expenditures for tax purposes, but also tax credits for enhanced oil recovery, tax credits for an established level of production from a marginal well, and favourable tax treatment for re-opening abandoned or orphaned wells. There are additional programmes on property transfer, state tax treatment, requirements to pay minimum taxes and a variety of other incentive mechanisms that may proceed to further stages of development.

The current rigidity of the US budget process is central to the evaluation of both the concept of producers' relief and of the feasibility of specific proposals. The new phrase in Washington is 'deficit-neutral'. The image of the budget deficit as a juggernaut destroying the US economy brings about the all-important 'scoring' process: proposals are evaluated for their loss to government revenue; offsetting revenue sources (new revenue streams and/or reductions in spending) must be found. Meritorious programmes may not even be debated if they do not pass this first test because the need to appear frugal and the stigma attached to being a 'budget-buster' are non-partisan.

The best tonic for the upstream sector is higher market prices. With prices currently running $4–6 per barrel higher than the aberrantly low first quarter 1994, the immediacy of the producers' plight has dimmed. At $20 per barrel, prices for West Texas Intermediate crude oil are comparable to levels a year ago. A meeting between the US President and 75 concerned lawmakers to discuss the concerns of oil producers and the states dependent on their activities would have been unlikely in mid-1993. The fact that such a meeting has taken place in June this year is a reflection of the price collapse of late 1993 and early 1994, not the more recent price levels. And the likelihood of a new comprehensive relief and incentive programme is inversely proportional to the price of oil. The possibility of innovative but limited programmes still exists, however. Most attractive will be incentives to target production that otherwise would not have taken place, and so create future new tax revenue streams.

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