

## 5. Emerging Issues

This chapter of *Performance Profiles* analyzes new developments and emerging directions of the larger energy industry. FRS data are combined with additional information from company annual reports, press releases, and other energy company public disclosures so as to expand the scope of energy industry financial analyses presented in this report. Specifically, this chapter presents three analyses ("Special Topics") that discuss:

- The level of activity of the U.S. major energy companies in energy production from renewable energy sources
- The level of success of mergers and acquisitions by the U.S. majors as a strategy in replacing their oil and natural gas reserves
- The role of the U.S. majors in the developing liquefied natural gas market in the United States

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### ***SPECIAL TOPIC: FRS Company Production From Renewables***

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Even though renewable energy sources constitute a small part of the U.S. energy mix, some of the large U.S. major energy companies reporting to EIA's Financial Reporting System (FRS) have become involved in renewables energy production. Specifically, in referring to the term "renewables," we are confining our discussion to geothermal, solar, and wind energy sources. Biomass is not significant in any FRS company's energy production. In addition, hydroelectric power has more than a hundred-year history in the United States and is beyond the scope of what can be addressed here.

Despite strong governmental and public interest in renewables, of the three renewables being discussed here only wind energy production has grown in the 1998 to 2002 period, by 242 percent from 0.031 quadrillion Btus to 0.106 quadrillion Btus.<sup>a</sup> Production from geothermal and solar has essentially remained steady over that period. Together, these three energy sources comprised just under one-half of one percent of total U.S. energy consumption in 2002.

### ***Geothermal Energy***

Geothermal energy chiefly is electric power that is derived from heat within the earth.<sup>b</sup> More specifically, geothermal energy comes from precipitation that over the eons has seeped deep into the ground and has been warmed by the natural heat of the earth. These heated geothermal fluids occur where magma has pushed close enough to the surface through fractures in the earth's crust. These heated fluids have been found and developed in reservoirs up to 9,800 feet deep. Wells are drilled to recover these fluids to the surface. There the fluids are converted into steam, and if necessary scrubbed to remove impurities, with excess fluids being returned to the reservoir. The scrubbed steam is then delivered by pipeline to a power plant. The power plant uses the steam to drive turbines to generate electric power.

Geothermal energy's environmental properties are considered benign: geothermal emissions consist mostly of water, and geothermal energy production requires no cooling water from the surrounding area.

The geological conditions necessary for harnessing geothermal energy have been found mainly in the Pacific Rim, particularly in the Philippines and Indonesia.

The Unocal Corporation is the only FRS company active in geothermal energy. It has been producing geothermal energy for over 30 years. Unocal's geothermal operations are in the Philippines, at Tiwi (330 megawatts of generating capacity) and Mak-Ban (426 megawatts of generating capacity),<sup>c</sup> and in Indonesia, at Gunung Salak (330 megawatts of generating capacity) and Wayang Windu (110 megawatts of generating capacity).<sup>d</sup> The two Philippines plants have been operating over thirty years and provide 15 percent of the electricity required by Luzon, the Philippines' largest island. Unocal began geothermal operations in Indonesia in 1982.

Together, these four projects supply steam for almost 1,200 megawatts of generating capacity. Unocal's total 2002 geothermal energy production averaged 13 million kilowatthours, the equivalent of 20,000 barrels of oil per day, down from 22,000 barrels per day in 2001.<sup>e</sup> Its net proved geothermal reserves at year-end 2002 were the equivalent of 232 million barrels of oil, compared to 162 million barrels in 2001.

## ***Wind Energy***

Wind energy is the harnessing of the wind to generate power. By turning like a pinwheel in the wind, wind turbines convert the energy in the wind into mechanical power. This mechanical power can be used directly for such things as grinding grain or pumping water or can be converted into electricity.

Environmentally, wind energy is considered a very clean source of power. The primary environmental concerns with wind are noise from the rotors, the visual aesthetics of wind farms, and potential harm to wildlife. Objections have been raised to proposed wind energy installation both inland and offshore.

Europe has the largest base of installed wind power capacity, at over 20,000 megawatts, particularly in Germany, Spain, and Denmark. The United States follows at 4,685 megawatts at year-end 2002.<sup>f</sup> Regions in the United States with an average annual wind speed of at least 13 miles per hour, a speed considered the threshold for undertaking a wind power project, are found along the East Coast, the Appalachian Mountains, the Great Plains, the Pacific Northwest, and California.<sup>g</sup>

A former FRS company, Enron, was active in wind power, but has divested its wind generating assets due to Enron's bankruptcy. Enron was active both in manufacturing wind power equipment and in developing wind farms. Both General Electric Co. and American Electric Power have purchased Enron wind assets.

Another FRS company, Shell Oil, has a parent (Royal Dutch/Shell) that has a modest wind energy program. Royal Dutch/Shell subsidiary Shell WindEnergy Inc. is building its largest wind farm to date near Lubbock, Texas, in a 50/50 percent joint venture with Padoma Wind Power.<sup>h</sup> This 160-megawatt project was scheduled to be completed by year-end 2003. Shell Wind Energy first entered the U.S. wind power market with its purchase of a 50-megawatt facility in Wyoming in 2001. The company also develops and operates wind parks in Europe.

One other FRS company, BP America, has a parent company (BP plc of the United Kingdom) with one wind project.<sup>1</sup> This is its jointly owned Nerefco oil refinery near Rotterdam, where it has nine wind turbines, with the power sold through the national power grid.

Although wind power represents a small part of the U.S. electric power generation mix, this renewable energy source has recently been growing faster, beginning in 1999. This is in part due to technological innovations improving performance and cost and also to a Federal tax credit of 1.5 cents per kilowatthour for electricity generated by wind turbines. This credit expired at year-end 2003. Although there had been two retroactive renewals of the tax credit in the past, it was not renewed a third time.

Despite the recent growth in generation from wind, there is not as yet a big presence by FRS companies in this renewable power source. Non-FRS companies are the market leaders in wind power in the United States. FPL Energy is the nation's largest generator of wind power, with 24 wind farms. American Electric Power is another big presence in wind power. Also, the Federal government's Bonneville Power Administration has increased its presence as a supplier of electric power from wind energy.

## **Solar Energy**

Solar energy refers to the harnessing of the power of the sun. Passive solar is a means of reducing energy consumption. As for actual energy production, there are primarily two types of solar energy: photovoltaic, which uses the sun's rays to generate electricity, and thermal, in which the sun's heat is concentrated and used directly for such applications as heating water or other liquids. Worldwide, most solar energy production is from the use of photovoltaics.

Solar energy is considered environmentally benign, with essentially no harmful emissions, and it also can be used for power generation. There seem to be fewer objections about solar's visual aesthetics than wind's, perhaps since solar collection facilities tend to be located remotely and not on high ground. However, solar power still represents a small part of the U.S. energy mix.

Two FRS companies, Shell Oil and BP America, have parent companies (Royal Dutch/Shell and BP plc) active in the solar energy business. They are primarily active in the solar equipment and facilities manufacturing end of the business, not in solar power production itself. This may be in part because solar has been used mainly in smaller, decentralized applications and much less in central station electric power generation.

Shell Solar is active in the photovoltaic but not the thermal portion of the solar manufacturing business, manufacturing solar components as well as complete solar systems. The company reports a total yearly manufacturing capacity of 60 megawatts of solar panels, with facilities in the United States and Europe.<sup>j</sup> Shell Solar acquired Siemens Solar in 2002<sup>k</sup> and reports a global market share of 13 percent.<sup>l</sup>

BP is active in solar equipment manufacturing, with nearly 30 years of experience in the United States and elsewhere.<sup>m</sup> BP reports being the largest user of solar energy in the world, employing solar power at BP service stations, plants, and offices.<sup>n</sup> BP Solar, headquartered in Maryland, does own and operate one small solar field in Paulsboro, New Jersey, for supplying electric power to the grid, a 350,000-kilowatthour per year field, enough for 50 homes.<sup>o</sup>

ChevronTexaco, with a fledgling solar program, has also begun operating a solar facility outside Bakersfield, California.<sup>p</sup>

## Conclusion

Interest in renewable energy resources has increased over time, due to both environmental and energy security considerations. Renewables are considered more environmentally benign than other fuels, with little to no air emissions or local water use. They are also viewed as enhancing energy security both by diversifying the portfolio of energy we use and by relying on resources that are domestically abundant.

The FRS companies producing renewable energy may be involved in these energy sources in part to keep up with potential advances in energy production technologies and perhaps also to enhance their environmental image.<sup>9</sup> However, there is no indication that renewable energy will constitute a substantial portion of the energy produced by FRS companies in the near future.

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<sup>a</sup>Energy Information Administration, *Renewable Energy Annual 2001*, DOE/EIA-0603(2001) (Washington, DC, November 21, 2002), Table 1. Web address:

<http://www.eia.doe.gov/cneaf/solar.renewables/page/rea2002.pdf>

<sup>b</sup>Other types of geothermal energy include geothermal heat pump and enhanced geothermal recovery (hot dry rock), which is a potential technology.

<sup>c</sup>Unocal Corporation, March 2002 discussion on "Philippine Geothermal." Web address:

<http://www.unocal.com/geopower/pgi.htm>

<sup>d</sup>Unocal Corporation, July 2003 discussion on "Unocal Geothermal Indonesia." Web address:

<http://www.unocal.com/geopower/ugi.htm>

<sup>e</sup>Unocal Corporation, 2002 Securities and Exchange Commission Form 10-K, p.18.

<sup>f</sup>United States Department of Energy, discussion on Wind Energy. Web address:

[http://www.eere.energy.gov/windpoweringamerica/pdfs/wpa/wpa\\_update.pdf](http://www.eere.energy.gov/windpoweringamerica/pdfs/wpa/wpa_update.pdf)

<sup>g</sup>U.S. Department of Energy, discussion on Wind Energy. Web address: <http://www.eere.energy.gov/windpoweringamerica>.

<sup>h</sup>Royal Dutch Shell, press release (July 23, 2003)

<sup>i</sup>BP plc, discussion on "Renewable Energy." Web address: [http://www.bp.com/enviro\\_social/environment/renewable.asp](http://www.bp.com/enviro_social/environment/renewable.asp)

<sup>j</sup>Royal Dutch Shell, September 2003 discussion on "Shell Renewables." Web address:

[http://www.shell.com/home/Framework?siteId=shellsolar&FC1=&FC2=%2FLeftHandNav%3FLeftNavState%3D1%2C0&FC3=%2Fshellsolar%2Fhtml%2Fiwgen%2Fabout\\_shell%2Ffact\\_fig\\_new\\_01291129.html&FC4=&FC5=](http://www.shell.com/home/Framework?siteId=shellsolar&FC1=&FC2=%2FLeftHandNav%3FLeftNavState%3D1%2C0&FC3=%2Fshellsolar%2Fhtml%2Fiwgen%2Fabout_shell%2Ffact_fig_new_01291129.html&FC4=&FC5=)

<sup>k</sup>Royal Dutch Shell, press release (January 23, 2002).

<sup>l</sup>Royal Dutch Shell, press release (September 11, 2003).

<sup>m</sup>BP plc, September 2003 discussion on "Renewable Energy." Web address:

[http://www.bp.com/enviro\\_social/environment/renewable.asp](http://www.bp.com/enviro_social/environment/renewable.asp)

<sup>n</sup>BP plc, September 2003 discussion on "BP Gas, Power & Renewables." Web address:

[http://www.bp.com/bp\\_businesses/transition\\_page.asp?id=39](http://www.bp.com/bp_businesses/transition_page.asp?id=39)

<sup>o</sup>BP plc, press release (April 22, 2003).

<sup>p</sup>ChevronTexaco Corporation, press release (June 5, 2003).

<sup>q</sup>Newsweek Magazine, September 22, 2003, advertisement by Shell Oil after page 10:

"One of our goals is to make solar energy cheaper ... It's part of our commitment to sustainable development, balancing economic progress with environmental care and social responsibility."

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## ***SPECIAL TOPIC: Recent Upstream Mergers: A Tradeoff Between Growth and Profitability?***

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In order to survive, oil and natural gas companies need to replenish their oil and natural gas resources as they are produced, even if demand for those fuels is stable. But with the demand for natural gas and petroleum forecast to grow sharply over the coming decade, continuing the trend of recent years, the question arises all the more prominently: what strategies do companies employ to obtain the natural gas and petroleum they intend to supply?

To shed light on this question, two choices companies face were examined: to find and develop the reserves themselves in areas they have mineral rights to, or to acquire reserves already discovered by others through mergers and acquisitions. This was termed the “make-or-buy” choice. Reasonable hypotheses were then developed to explain why companies choose one strategy or the other.

The universe of companies examined to test these hypotheses was the set of companies responding to EIA’s FRS that held oil or natural gas reserves in the United States during the 1997 to 2002 period.

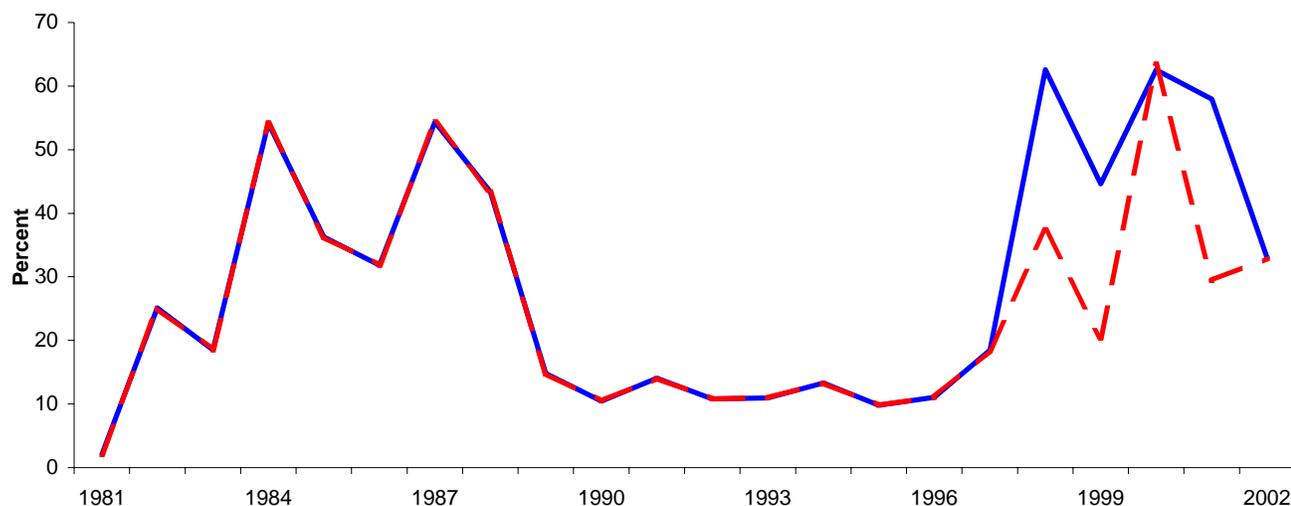
More particularly, these companies are: TotalFinaElf USA, Shell Oil Company, Burlington Resources Inc., ConocoPhillips Company, Inc., Marathon Oil, Corp., Exxon Mobil Corporation, Amerada Hess Corporation, Anadarko Petroleum, Inc., Unocal Corporation, Apache Corporation, EOG Resources, Inc., Devon Energy Corporation, Kerr-McGee Corporation, BP America, Inc., Williams Companies, Inc., Occidental Petroleum Corporation, ChevronTexaco Corporation, Dominion Resources, Inc., El Paso Corporation, and XTO Energy, Inc.

The 1997 to 2002 period of study was chosen because, while there were relatively few mergers among the FRS companies in the first part of the 1990’s, around 1997 a wave of mergers began, continuing through 2002 (Figure 37).

What goes into a company’s decision on how to obtain the natural gas and petroleum it intends to supply? Since it is costly to find oil and natural gas resources that will yield successfully producing wells and since the FRS companies are profit seekers, it is natural to examine oil and gas finding costs as an explanatory factor. A company’s finding cost is its average cost of finding a unit of reserves. Other things being equal, one would expect that companies which faced higher finding costs for oil and gas resources would tend to be buyers of reserves, whereas companies with lower finding costs would tend to be “makers” of reserves (that is, develop their own reserves in areas where they had mineral rights). To test these explanations, the FRS data was examined.

In fact, the data revealed a tendency for companies with higher finding costs to buy their reserves rather than “make” them. As expected, for companies with higher finding costs, buying reserves is the strategy that entails relatively lower cost (Table 21). However, the statistical significance of these results was below the threshold of significance. Consequently, the data hint at the tendency just described, but are not strong enough to warrant a definite conclusion on this score.

**Figure 37. Share of FRS Companies' Domestic Oil and Natural Gas Reserve Additions due to Mergers and Acquisitions, 1981-2002**



Note: Solid line includes U.S. reserves added in BP-Amoco (1998), Exxon-Mobil (1999), BP Amoco-ARCO (2000), Chevron-Texaco (2001), and El Paso-Coastal (2001) mergers as purchases in addition to all other transactions. These mergers were accounted for using the "pooling of interests" method, which does not record reserves acquired in a business combination as purchased reserves. For mergers initiated after June 30, 2001, the Financial Accounting Standards Board (FASB) no longer allows the use of this method of accounting in business combinations. Dashed line excludes the effects of accounting for "mergers as purchases."

Source: Energy Information Administration, Form EIA-28 (Financial Reporting System).

**Table 21. Average Finding Cost and Return on Investment for FRS Companies, 1997-2002**

Company Type	1997-2002	
	U.S. Finding Cost (Dollars Per Barrel of Oil Equivalent)	Return on Investment (Percent)
<b>Makers</b>	6.83	12.71
<b>Buyers</b>	7.88	10.25

Notes: Included are those 20 companies that were FRS respondents in 2002 and had oil or natural gas reserves (this, for example, excluded FRS respondents who are only refiner/marketer companies). Return on investment is net income as a percent of net property, plant, and equipment.

Source: Energy Information Administration, Form EI-28 (Financial Reporting System).

An interesting finding was that companies having a higher "purchase ratio", that is, the ratio of reserve additions that were purchased to reserve additions that were developed by the company, tended to have higher growth in reserves. One possible explanation for this might be that these companies adopted a strategy of fast growth, and the way for them to achieve that was to buy reserves rather than the slower process of developing their own.

The rate of return on investment was also examined for both the "make" companies and the "buy" companies (Table 21). It turns out that "makers" tended to have a higher return on investment than "buyers." Furthermore, unlike the result for finding costs, this result was statistically significant. One possible explanation for this outcome is that "makers" may have been focusing on maximizing profits while "buyers" were focusing on growing fast.

Another possibility is that the initial endowments of these two types of companies, their starting positions, were different. This may have led to different strategies and consequently different outcomes in profitability. Specifically, companies tending toward the strategy of “making” their own reserves, relative to companies electing to buy reserves, may have been endowed with more lucrative assets: namely, a base of reserves tending to be relatively rich and productive. Whether having a relatively fortunate initial position stems from good fortune or shrewd decision-making in the past is an open question. Thus, although the level of finding costs that an FRS company experiences is one of the factors that a company would examine, it evidently does not, by itself, determine the choice of reserve acquisition and replacement strategy.

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<sup>a</sup>Energy Information Administration, *Financial Aspects of the U.S. Oil and Gas Industry in the 1980's*, DOE/EIA-0524 (Washington, DC, May 1989).

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## ***SPECIAL TOPIC: LNG -- A Future for the FRS Companies?***

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There appears to be steadily increasing interest in LNG as an energy source in the United States, as alternative sources are being sought to satisfy the anticipated growth in demand for natural gas. The FRS companies play a major role in the United States' LNG market: they own two of the four LNG import facilities and the sole export facility in the United States.<sup>a</sup>

While FRS company investment in LNG is clearly an important part of supplying U.S. energy needs, the discussion below indicates that FRS company activity in LNG was mixed in 2002: some FRS companies expanded their LNG activities while others contracted in that area.

### ***Domestic Facilities: Cove Point, Elba Island, and Alaska's Kenai Peninsula.***

In September 2002, Dominion Resources bought the Cove Point LNG facility in Lusby, Maryland, for \$225 million from The Williams Companies (another FRS company).<sup>b</sup> The purchased assets include an LNG import facility, an LNG storage facility, and an approximately 85-mile natural gas pipeline feeding into an established natural gas market in the mid-Atlantic region. Dominion reports that capacity at the Cove Point facility is fully booked.<sup>c</sup> The El Paso Corporation also held rights to capacity at the Cove Point LNG regasification facility. However, in the fourth quarter of 2002, El Paso sold that capacity (along with its position in the LNG purchase and sale agreement at Cove Point) to Norway's Statoil for \$210 million.

Serving the natural gas market in the southeastern United States is a facility which El Paso still owns, the LNG terminal and regasification facility at Elba Island, Georgia. This facility began receiving deliveries in December 2001.<sup>d</sup> In August 2002, Marathon acquired capacity rights for 22 years for delivering LNG to the Elba Island facility.<sup>e</sup> This would provide a potential outlet for Marathon-owned

natural gas resources located near the company's proposed LNG plant in Equatorial Guinea, where the natural gas would be liquefied and shipped to Elba Island for regasification and subsequent distribution to the U.S. southeastern natural gas market.<sup>f</sup>

There is only one LNG export facility in the United States, located on the Kenai Peninsula in southern Alaska. At present, it is entirely devoted to serving the Pacific Rim natural gas market.<sup>g</sup> Phillips built this 230-million-cubic-foot-per-day export facility in a joint venture with Marathon.<sup>h</sup> ConocoPhillips, the result of the recent merger of Conoco and Phillips, owns a 70-percent share and is the operator of the facility, while Marathon owns the other 30 percent. Export began in 1969, under a 15-year contract to supply LNG to Tokyo Electric and Tokyo Gas. Shipping to those two utilities has continued uninterrupted since then. As with the investment in the Kenai Peninsula LNG export facility, much of FRS companies' investments in LNG projects abroad is intended for the Pacific Rim market, with some also aimed at portions of the European market.

### ***Investments in LNG Facilities Abroad: Qatar and Australia***

The Exxon Mobil Corporation has been involved with LNG for more than thirty years, and, through its subsidiaries, has had a presence in Qatar since 1935,<sup>i</sup> where Exxon Mobil owns interest in two LNG projects:<sup>j</sup>

- Qatargas, in which Exxon Mobil has a 10-percent interest, with most of the LNG going to Japan and Spain.
- RasGas LNG facilities, in which Exxon Mobil has a 25-percent interest, with most of the LNG going to Korea. Exxon Mobil also has a 28.5-percent interest in the two additional RasGas LNG trains currently under construction, each with a planned capacity of 4.7 million metric tons per year, intending to supply India and Europe.

The ChevronTexaco Corporation holds a one-sixth interest in the North West Shelf Venture in Australia.<sup>k</sup> About 60 percent of the natural gas from this venture is sold in the form of LNG to Japanese utilities, with the remaining natural gas being sold in the Australian domestic market.<sup>l</sup> A project to increase this LNG capacity by about 50 percent is currently under construction, and a conditional 25-year agreement was signed with China in October 2002 to supply the proposed Guangdong LNG Terminal Project.<sup>m</sup>

ConocoPhillips also has ownership in major natural gas production ventures in the Bayu-Undan field in the Timor Sea off Australia, and is in development phase of a planned liquefaction facility near Darwin, Australia.<sup>n</sup> To market this LNG, in March 2002 ConocoPhillips signed an agreement with the same two utilities it has been supplying, Tokyo Electric and Tokyo Gas, for the sale of LNG for 17 years.<sup>o</sup>

### ***Financial Distress Causes Retrenching in LNG: El Paso***

During 2002, El Paso felt the effects of the downturn of the energy trading and merchant services businesses that began with the demise of Enron in 2001.<sup>p</sup> Contributing to its financial pressures, El Paso suffered from a \$67-million decline in the fair value of its LNG supply contract derivatives in 2002 compared to a \$86-million increase in the fair value of those contracts in 2001.<sup>q</sup> El Paso stated that the significant capital and credit requirements associated with the LNG business were in excess of its current financial capacity.<sup>r</sup>

El Paso responded to these developments by initiating a series of actions to wind down its involvement in non-core businesses including energy trading and petroleum markets, as well as the capital-intensive business of LNG operations.<sup>s</sup> In particular, in February 2003 El Paso extricated itself from obligations to charter four LNG tankers, in exchange for payments by El Paso totaling \$24 million.<sup>t</sup>

### **What Next?**

There are many proposals by FRS and other companies to build LNG facilities, with varying degrees of promise. Some proposals may be intended as strategic moves by a company considering investing in a particular LNG market, designed to discourage other companies from entering that market. However, actual investment in LNG facilities, particularly in liquefaction, requires large commitments of capital. Not all companies are currently in a strong enough financial position to risk undertaking such projects. Nonetheless, given the ever-increasing demand for natural gas, involvement by the FRS companies in the LNG market warrants continued watching.

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<sup>a</sup> The two domestic import LNG facilities in which the FRS companies have no ownership are in Lake Charles, Louisiana and Everett, Massachusetts.

<sup>b</sup> Dominion Resources, Inc., 2002 Securities and Exchange Commission Form 10K, p. 3.

<sup>c</sup> Dominion Resources, Inc., 2002 Annual Report, p. 12.

<sup>d</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, p. 5.

<sup>e</sup> Marathon Oil Corporation, 2002 Securities and Exchange Commission Form 10K, p. 19.

<sup>f</sup> Marathon Oil Corporation, 2002 Annual Report, p. 3.

<sup>g</sup> Phillips Petroleum Company, Press Release (September 14, 2000).

<sup>h</sup> Marathon Oil Corporation, Press Release (February 28, 2002).

<sup>i</sup> Exxon Mobil Corporation, Press Release (April 4, 2001).

<sup>j</sup> Exxon Mobil Corporation, 2002 Financial & Operating Review, p.48

<sup>k</sup> ChevronTexaco Corporation, 2002 Annual Report, p. 1.

<sup>l</sup> ChevronTexaco Corporation, 2002 Annual Report, p. 23.

<sup>m</sup> ChevronTexaco Corporation, 2002 Annual Report, p. 23.

<sup>n</sup> ConocoPhillips, 2002 Annual Report, p. 17.

<sup>o</sup> ConocoPhillips, 2002 Annual Report, p. 14.

<sup>p</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, pp. 1-2.

<sup>q</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, p. 60.

<sup>r</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, p. 22.

<sup>s</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, p. 2.

<sup>t</sup> El Paso Corporation, 2002 Securities and Exchange Commission Form 10K, p. 23.

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