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THE EFFECT OF WHOLESALE MARKET DEREGULATION ON SHAREHOLDER WEALTH IN THE ELECTRIC POWER INDUSTRY*

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ABSTRACT

This paper analyzes electric utility stock price reactions to events preceding the passage of the Energy Policy Act of 1992, a development that precipitated the onset of competition in the wholesale sector of the electric utility industry and accelerated the pace toward state-level deregulation of the retail sector. For the industry as a whole, we find that, at worst, investors had neutral reactions to events preceding wholesale deregulation. However, stock price reactions vary systematically with differences in incumbent utilities' marginal costs, though not with differences in fixed costs or purchased power costs. These results are consistent with the notion that new technologies have substantially reduced barriers to entry into the electric power generation industry, rendering capital cost advantages of incumbent utilities vulnerable to being neutralized by new entrants. However, marginal cost advantages are more likely to be sustainable because they are likely to be driven by inimitable locational advantages.

I. INTRODUCTION

THE structure of electric power markets in the United States underwent significant change in the 1990s. At the beginning of the decade, electricity was one of the most tightly regulated industries in the United States. As the 1990s came to a close, Congress had deregulated wholesale power markets in the United States; several states, such as California and Rhode Island, had significantly restructured their retail electricity markets; and many others were in the process of moving toward full deregulation of these markets.

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A key driver of deregulatory activity in this industry was the widespread perception that the regulated price of electricity in many jurisdictions exceeded the price that would prevail in an unregulated competitive market.[1] This "price gap" was thought to arise because of changes in technology (that is, the availability of single and combined-cycle gas turbines) that reduced entry barriers and lowered operating costs and because incumbent utilities had made large sunk investments in older, higher-cost technologies on which they were entitled to earn fair returns. In addition, many regulated utilities were saddled with obligations to purchase power under long-term contracts from nonutility generators (NUGs) under the provisions of the 1978 Public Utilities Regulatory Act at costs that are likely to be higher than the costs of a new entrant.

Regulatory changes typically have both effects across the industry and effects on individual firms. That is, the regulatory change can affect the average level of profitability in the industry as a whole. However, some firms may be able to adjust to the regulatory changes more easily than others and thus will be affected by deregulation to a different degree than the average firm. The issue of how firms are affected by electricity deregulation is an important part of the debate because most restructuring initiatives at the state level in the United States have been accompanied by attempts to allow firms to recover the stranded costs that arise as the market moves from regulated monopoly to competition.

The purpose of this paper is to study how firm-level characteristics affected investor reactions to key events preceding the passage of the Energy Policy Act of 1992 (hereafter the "Act"). By deregulating wholesale electricity markets, the Act dramatically affected the competitive structure of the U.S. electric utility industry. A central focus of our study is how investor responses to deregulation varied with differences in incumbent utilities' cost positions. In particular, we ask: did investors expect that cost advantages acquired by utilities in a regulated environment would be valuable and sustainable in a deregulated environment? If (as was widely believed to be the case) wholesale markets are characterized by free entry of new entrants operating with state-of-the-art technologies, the cost advantages of existing utilities that prevailed at the onset of deregulation might not be expected to count for very much. At best, the most efficient incumbent firms would merely hold their own against the onslaught of efficient new entrants (perhaps even by adopting the same technologies used by entrants). At worst, even the most efficient incumbents would be vulnerable to being underpriced by new market entrants. If, by contrast, the cost advantages enjoyed by incumbents reflected access to "sticky factors" (for example, locational advantages) that new entrants could not replicate, then incumbent utilities fortunate enough to possess a cost advantage might not be harmed by deregulation to the same degree as the average firm. By studying how relative cost positions affect shareholder reactions to deregulation events, we can learn something about the

[1] Matthew W. White, Power Struggles: Explaining Deregulatory Reforms in Electricity Markets, 1996 Brookings Papers on Econ. Activity: Microecon. 201.

persistence of cost-based competitive advantages and disadvantages in markets for electric power.

Our main empirical findings are as follows. For the industry as a whole, we find a neutral stock price reaction to events that presaged passage of the 1992 Act. However, utilities with low marginal costs experience a more favorable stock price reaction than utilities with high marginal costs. This effect is particularly pronounced when utilities have excess capacity. Stock price reactions do not, however, vary systematically with the magnitude of firms' capital cost advantages, nor do they vary with differences in the extent to which existing utilities benefited from more favorable contractual commitments for purchased power. Overall, then, investors responding to events leading up to the onset of wholesale deregulation expected that marginal cost advantages of incumbent utilities would be valuable in the postderegulation market but that incumbents' capital and purchased power cost advantages would not be especially valuable. These findings are broadly consistent with Matthew White's characterization of the industrial organization of electricity markets in the early 1990s.[2] The ability of new entrants to take advantage of new technologies and enter with significantly lower levels of capital investment than incumbent utilities would be expected to undermine the value of existing capital cost advantages enjoyed by incumbent utilities. The reduction of entry barriers would probably also diminish advantages accruing to a utility owing to its ability to purchase power on more favorable terms than other incumbent utilities. By contrast, one might expect that marginal cost advantages would be more valuable because they are more likely to reside in factors of production, particularly location, that are likely to be more difficult for new entrants to replicate.

The use of event study methodology to study reactions to regulation and deregulation events is well established. Katherine Schipper, Rex Thompson, and Roman Weil[3] and Nancy Rose[4] use it to analyze the profit implications of trucking deregulation in the United States; Pablo Spiller[5] and Messod Beneish[6] use it to study the expected impact of deregulation on profits in the U.S. airline industry, and Antony Dnes and coauthors[7] study stock price reactions to the initiation of price-cap regulation in the electricity industry in the United Kingdom. Our paper is clearly related to these contributions. In particular, as in Beneish's analysis of

[2] *Id.*

[3] Katherine Schipper, Rex Thompson, & Roman L. Weil, Disentangling Interrelated Effects of Regulatory Changes on Shareholder Wealth: The Case of Motor Carrier Deregulation, 30 J. Law & Econ. 67 (1987).

[4] Nancy L. Rose, The Incidence of Regulatory Rents in the Motor Carrier Industry, 16 RAND J. Econ. 299 (1985).

[5] Pablo T. Spiller, The Differential Impact of Airline Regulation on Individual Firms and Markets: An Empirical Analysis, 26 J. Law & Econ. 655 (1983).

[6] Messod D. Beneish, The Effect of Regulatory Changes in the Airline Industry on Shareholders' Wealth, 34 J. Law & Econ. 395 (1991).

[7] Antony W. Dnes *et al.*, The Regulation of the United Kingdom Electricity Industry: An Event Study of Price-Capping Measures, 13 J. Reg. Econ. 207 (1998).

airline deregulation, we find evidence that investors expect competitive advantages attained in regulated markets to persist in deregulated markets.[8]

The rest of this paper is organized as follows. Section II discusses the changing competitive climate in the industry, events leading up to the 1992 Act, and its potential effects. Section III develops the hypotheses to be tested. Section IV describes data, variable specification, and research methodology. Section V analyzes the results. Section VI concludes.

II. The 1992 Energy Policy Act

The electricity industry in the United States consists of over 200 vertically integrated investor-owned utilities that serve particular geographic regions and several thousand nonintegrated municipal, state, and cooperative distribution enterprises that purchase their power requirements on a wholesale bulk basis. Wholesale markets for electricity grew in the 1970s as private utilities began to purchase power from each other in order to economize on the marginal costs of self-generated electricity and to achieve economies of coordination.

Further growth in wholesale markets occurred owing to the 1978 Public Utilities Regulatory Policies Act (PURPA), which created a class of NUGs (cogeneration and small-power production facilities, referred to as qualifying facilities, or QFs) exempt from price regulation. Furthermore, PURPA required utilities to purchase electricity from these QFs at a rate that reflected the incremental costs that they would have incurred in producing the power themselves ("avoided costs"). Thus, PURPA marked the first initiative toward creating competitive electric power markets in the United States.

The movement toward deregulation increased in the late 1980s. In March 1988, the Federal Energy Regulatory Commission (FERC) issued two Notices of Proposed Rulemaking (NOPRs) that, if enacted, would have affected the structure of the industry.[9] These NOPRs proposed the creation of a new class of independent power producers virtually exempt from regulation and delineated guidelines for the establishment of competitive bidding procedures for the building of additional generating capacity. These NOPRs, which were widely opposed and aroused dissenting voices even within FERC, raised concerns that competition in the electric utility industry would cause serious problems in the reliability, availability, and efficiency of electric power supply in the United States.

In January 1989, the Office of Technology Assessment issued a report on the technical requirements for introducing greater competition in the electric power industry and found no "insurmountable problems of technical feasibility" with any of the scenarios it examined for deregulation.[10] The Bush administration began drafting a new energy bill a few months later, but this effort was given low

[8] Beneish, *supra* note 6.

[9] The NOPRs were Docket Nos. M88-4-000 and RM88-5-000.

[10] Office of Technology Assessment, Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition (January 1989).

priority owing to the public's lack of interest in energy-related matters. The Persian Gulf crisis brought energy matters back to the fore, and in February 1991, the Bush administration officially announced its National Energy Strategy Act. The Congress took up energy legislation in earnest in 1992, and by the summer of that year, both the House and the Senate had passed versions of an energy bill. President Bush signed the Energy Policy Act into law in October 1992.

The Act had three main provisions. First, it amended the Public Utilities Holding Company Act of 1935 to create a new class of independent power producers called "exempt wholesale generators" (EWGs). The EWGs were allowed to produce and sell electricity in unregulated wholesale markets to electric utilities and municipalities. Second, the Act provided for mandatory wholesale wheeling. That is, it gave FERC the authority to order a utility to transport electricity over its transmission network for wholesale power transactions. Third, the Act required that rates charged for mandatory wholesale wheeling promote economic efficiency in the transmission and generation of electricity. According to this provision, wholesale rates should ensure that the costs incurred by a utility to provide wholesale wheeling are recovered from the party seeking the wheeling and not from the utility's existing customers. William Baumol and J. Gregory Sidak interpret this last provision to imply that the Act gave FERC the authority to mandate the recovery of stranded costs through appropriately constructed transmission charges, a policy FERC later adopted in Order 888 in 1996.[11]

The Act had two broad effects on electric power markets in the United States. First, it opened up the wholesale market to competition. A wholesale customer, such as a municipal utility, that obtained power from the local supplier could, as a result of the Act, contract with any interconnected EWG for its wholesale power requirements. The wholesale electricity market, though smaller than the retail market, is significant in its own right (1995 sales totaled $43 billion), and nearly all U.S. investor-owned utilities were affected by wholesale deregulation. Second, the Act increased the momentum toward deregulation of the larger retail market ($208 billion in sales in 1995). It is widely believed by industry participants and observers that the passage of the Act increased the likelihood that states would mandate retail wheeling.[12] Indeed, it was only after the passage of the 1992 Act that management discussion sections in electric utility annual reports began to include passages warning investors that major structural changes at the

[11] Order No. 888, 75 FERC 61,080 (1996). William J. Baumol & J. Gregory Sidak, Transmission Pricing and Stranded Costs in the Electric Power Industry (1995).

[12] An indication of the pervasiveness of this view is that analyst accounts of the 1992 Act occasionally state that the Act "allowed" state-level deregulation, even though the provisions of the Act did not deal at all with retail electricity markets, other than to explicitly preclude FERC from ordering retail wheeling. For example, one account states that the 1992 Act "permits states to deregulate their retail power markets, allowing users to buy power from any source." Investment Forum: Playing the Electric Utility Game under Different Rules, Bond Buyer, July 13, 1995, at 8.

retail level were on the horizon.[13] And, of course, subsequent to the passage of the Act, several states, including California and Rhode Island, enacted legislation that allowed for some form of retail wheeling.

III. Deregulation and the Sustainability of Cost Advantages

Investment analysts predicted that deregulation would hurt some utilities but benefit others. According to most analysts, the utilities that would cope with deregulation most effectively would be those that had developed cost advantages: "Those utilities with high average kilowatt-hour (kwh) production costs and a significant industrial customer base will be most severely affected. For those with a large industrial customer base but more competitive average kilowatt-hour production costs, however, the increased competition is likely to be less of a problem. Indeed, such companies, if they also have excess capacity, may even benefit from the partial deregulation."[14]

Production costs differ significantly across utilities. Table 1 shows the cost differences within various North American Reliability Council (NERC) regions.[15] (Figure 1 shows a map of the nine NERC regions.) Panel A of Table 1 illustrates that the intraregion marginal cost differences are most pronounced within the Northeast Power Coordinating Council (NPCC) and Western Systems Coordinating Council (WSCC) regions. Within these regions, the marginal costs of the most efficient utilities are about half the corresponding regional average, and the marginal costs of the highest cost producers exceed those of the lowest cost producers by a ratio of nearly three to one. Panel B of Table 1 shows differences in fixed costs per kilowatt-hour of electricity within each NERC region. Fixed costs include nonvariable operation and maintenance costs, as well as depreciation charges. Wide differences in fixed costs per kilowatt-hour of electricity exist within almost all NERC regions.

Factors that impede the ability of existing firms or new entrants to replicate or neutralize the competitive advantages of low-cost firms are called isolating

[13] For instance, the 1992 annual report of San Diego Gas & Electric stated: "Industry analysts say it's only a matter of time before the principles of our traditional regulated business fall prey to competition. More importantly, SDG&E asks, what's taking so long? The regulatory decisions of the past year have put the industry on notice that competition for providing gas and electric services to core customers will increase as access to markets is opened up to independent power producers. The production of electricity within SDG&E's own service territory—an area once protected by state regulations—is threatened by invasion. The company's network of transmission lines used to transmit electricity are also targets of competition. In the near future, independent unregulated companies may be given access to the company's transmission lines, which competitors would lease and use to sell their own electricity in a process called retail wheeling."

[14] Standard and Poor's Industry Surveys, January 14, 1993, at U27.

[15] The North American Reliability Council was formed in 1968 to enhance the reliability of bulk power supplies in the United States. It consists of nine Regional Reliability Councils, each of which represents an interconnected regional transmission network. It encompasses virtually all of the power systems in North America.

TABLE 1

DESCRIPTIVE STATISTICS FOR 1993 VARIABLE AND FIXED PRODUCTION COSTS BY NERC REGION

Region	N	Mean	Max	Q3	Med	Q1	Min
A. MARGINAL COSTS							
ECAR	15	1.55	1.88	1.67	1.54	1.41	1.21
ERCOT	3	2.11	2.28	2.28	2.20	1.86	1.86
MAAC	8	1.79	2.70	2.03	1.62	1.48	1.33
MAIN	8	1.68	2.33	1.87	1.61	1.41	1.34
MAPP	5	1.42	2.03	1.47	1.30	1.15	1.13
NPCC	11	2.45	3.40	3.08	2.26	1.82	1.25
SERC	8	1.77	2.40	1.87	1.79	1.63	1.17
SPP	6	1.76	2.05	2.00	1.87	1.65	1.09
WSCC	14	1.48	2.45	1.80	1.41	1.07	.69
B. FIXED COSTS							
Region	N	Mean	Max	Q3	Med	Q1	Min
ECAR	15	1.77	3.44	2.21	1.71	1.25	.73
ERCOT	3	1.73	1.96	1.96	1.88	1.34	1.34
MAAC	8	2.46	4.13	3.39	2.53	1.50	.70
MAIN	8	1.64	3.30	2.19	1.25	1.08	.80
MAPP	5	1.60	2.43	1.78	1.55	1.40	.84
NPCC	11	2.55	3.58	2.99	2.75	2.07	1.10
SERC	8	1.48	2.25	1.60	1.41	1.24	1.07
SPP	6	1.28	2.43	1.63	.98	.84	.53
WSCC	14	1.91	4.00	2.47	1.52	1.31	.75

NOTE.—Costs are in cents per kilowatt-hour. Marginal costs = fuel + variable operation and maintenance costs per kilowatt-hour of electricity. Fixed costs per kilowatt-hour of electricity = (nonvariable portion of operation and maintenance costs + rate recovery of utility investment, including depreciation on generation assets and return on invested capital) per kilowatt-hour of electricity. The acronyms represent the following regions: NERC = North American Electric Reliability Council, ECAR = East Central Area Reliability Coordination Agreement, ERCOT = Electric Reliability Council of Texas, MAAC = Mid-Atlantic Area Council, MAIN = Mid-America Interconnected Network, MAPP = Mid-Continent Area Power Pool, NPCC = Northeast Power Coordinating Council, SERC = Southeastern Electric Reliability Council, SPP = Southwest Power Pool, and WSCC = Western Systems Coordinating Council.

mechanisms.[16] Isolating mechanisms are closely related to both mobility barriers and entry barriers. A mobility barrier is an isolating mechanism that protects the competitive advantage of a "strategic group" of firms within an industry,[17] while an entry barrier is an isolating mechanism that protects the profitability of an entire industry. Isolating mechanisms allow a firm with a competitive advantage to sustain positive economic profitability from that advantage despite free entry and fierce price competition that drives the economic profits of marginal firms to zero.

The inimitability of scarce factors of production (for example, superior geo-

[16] Richard P. Rumelt, Towards a Strategic Theory of the Firm, in Competitive Strategic Management 556 (Richard Lamb ed. 1984).

[17] R. E. Caves & M. E. Porter, From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition, 91 Q. J. Econ. 241 (1977).

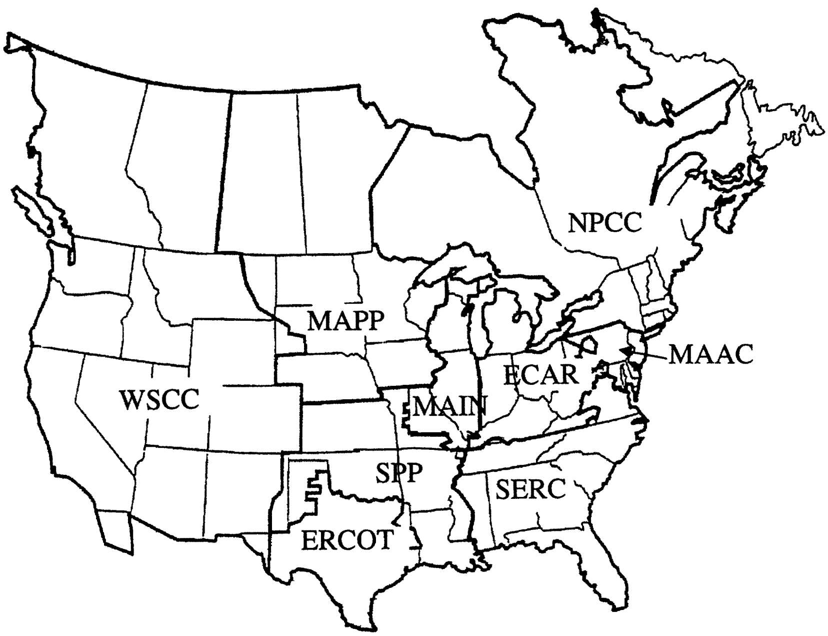

FIGURE 1.—The acronyms represent the following regions: NERC = North American Electric Reliability Council, ECAR = East Central Area Reliability Coordination Agreement, ERCOT = Electric Reliability Council of Texas, MAAC = Mid-Atlantic Area Council, MAIN = Mid-America Interconnected Network, MAPP = Mid-Continent Area Power Pool, NPCC = Northeast Power Coordinating Council, SERC = Southeastern Electric Reliability Council, SPP = Southwest Power Pool, and WSCC = Western Systems Coordinating Council.

graphic locations that cannot be replicated) can be an isolating mechanism. The need to make large sunk investments to replicate the competitive advantages (for example, scale-based cost advantages or brand reputations) of incumbent firms can also be an isolating mechanism.[18] Still another type of isolating mechanism derives from informational imperfections that make it difficult for new entrants or less profitable firms to identify and thus copy the input mixes or "formulas for success" of high-profit firms.[19] Finally, the absence of environmental changes that create opportunities for entrants or existing firms to "substitute around" the stocks of scarce inputs (for example, geographic locations and technological

[18] In the strategy literature, competitive advantages based on the unwillingness of challengers to make the sunk investments needed to replicate the production costs or brand reputations of incumbent firms are called positional advantages.

[19] Rumelt, *supra* note 16, calls this causal ambiguity.

expertise) that underpin a firm's competitive advantage can also be an isolating mechanism.[20]

If postderegulation markets are characterized by limited isolating mechanisms, the prevailing cost advantages of low-cost incumbent utilities will not be sustainable. New firms will enter the market and achieve cost positions that are as low or lower than low-cost utilities. At the same time, high-cost utilities, spurred by the pressures of competitive markets, will be able to take steps to reduce their costs to neutralize the advantage of their low-cost rivals. By contrast, if competitive positions in deregulated markets are protected by significant isolating mechanisms, then prevailing cost advantages will be sustainable, and the cost advantages of incumbent utilities acquired under regulation would persist over time. In this case, incumbent utilities that possess cost advantages at the onset of deregulation would be expected to perform better in a deregulated market than incumbent utilities that had failed to establish cost advantages while subject to regulation.

Previous event studies of the effects of deregulation on shareholder wealth in the airline industry have found evidence of significant isolating mechanisms. For example, Beneish finds that airlines that had taken steps to establish hub-and-spoke systems prior to the deregulation of the airline industry in 1978 were expected by investors to be less adversely affected by the onset of competition than airlines that had not established significant hub networks.[21] In the electric power industry, it is an interesting question whether cost advantages developed in a regulated regime are likely to be sustainable when power markets are deregulated. On the one hand, the economics of generation have changed in recent years. As a result of technological innovation arising from aircraft engine derivative-generation technology (the combined-cycle generating technology), lead times in new plant construction have been reduced considerably. A firm can, for example, construct and shake down a state-of-the-art, efficiently scaled generation plant in as little as 18 months. Moreover, existing differences in fixed costs across incumbent utilities are mainly driven by differences in the degree to which incumbents invested in nuclear power facilities. This suggests that incumbent utilities that enjoy lower fixed costs would be unlikely to enjoy significant competitive advantages in a deregulated environment since the capital costs of entrants that adopt new technologies are likely to be at least as low as the capital costs of most low-cost incumbent utilities. That is to say, changes in technology have probably undermined the sustainability of cost advantages based on fixed costs, and we might therefore expect that fixed-cost advantages developed under regulation would probably not be especially valuable in deregulated markets.

On the other hand, certain variable-cost advantages might be sustainable. Fuel is a significant component of variable production costs, and geographic location

[20] Pankaj Ghemawat, Commitment (1991).

[21] Beneish, *supra* note 6.

is a key driver of fuel cost differences across utilities. For example, utilities near coal fields might pay between 60 cents and $1.20 per million British thermal units (BTUs) for fuel, while more distant utilities would pay between $1.50 and $2.00 per million BTUs.[22] Since utility investments are site specific and favorable geographic locations are scarce, fuel cost advantages based on favorable geographic locations would be difficult for new entrants to replicate. Thus, a utility that established a location-based cost advantage under a regulated regime might continue to be cost competitive vis-à-vis new entrants operating with state-of-the-art technologies in a deregulated market. If so, these incumbents would fare better under regulation than incumbents without existing cost advantages.

In summary, if prevailing cost advantages of low-cost incumbent utilities are not expected to be sustainable in deregulated markets, low-cost utilities would experience the same stock price reaction to deregulation events as high-cost utilities since both groups would be equally vulnerable to efficient new entrants. If, by contrast, the prevailing cost advantages are expected to be sustainable, we expect to find cross-sectional differences in utility stock price reactions depending on utilities' prevailing costs. Our expectation is that marginal-cost advantages, because they are likely to be based on a sticky factor (location), are more likely to be sustainable than fixed-cost advantages, which are mainly based on a factor (technology vintage) for which low-cost substitution possibilities exist.

IV. Data and Methodology

A. *Events, Sample, and Methodology*

By searching issues of *The Congressional Quarterly Weekly Reports* and the energy library of the LEXIS-NEXIS database, we identified seven key political and legislative events associated with the passage of the Energy Policy Act of 1992. Table 2 describes these events. Our first event is the initial circulation of the Bush administration's National Energy Strategy proposal to the press on February 8, 1991. Our last event is the signing of the Energy Policy Act by President Bush in October 1992.

Event studies of regulatory changes depend on a persuasive specification of the first date at which the regulatory change is anticipated by the market. In this case, some events prior to 1991 might be considered part of the move toward deregulation. For example, as discussed in Section II, FERC issued two NOPRs in 1988 that could be interpreted as paving the way toward deregulation. However, these NOPRs were opposed within FERC itself and were never issued as final orders. It seems unlikely that their issuance led investors to conclude that deregulation was imminent. Indeed, after the issuance of the NOPRs in 1988, FERC took no steps to move the industry closer to deregulation.

Even though the Bush administration began working on a comprehensive

[22] David E. Wojick, Regional Power Markets: Roadblock to Choice? 135 Pub. Util. Fort. 28 (1997).

TABLE 2

EVENTS RELATING TO THE PASSAGE OF THE ENERGY POLICY ACT OF 1992

Event	Date	Description
1	February 8, 1991	Details of the proposed National Energy Strategy Act are leaked to the press
2	February 20, 1991	Provisions of the new proposed Act are officially released by the authorities
3	February 19, 1992	Senate passes Energy Bill S. 2766[a] introduced by Senator J. Bennett Johnston
4	May 27, 1992	The National Energy Bill (H.R. 776)[b] is passed by the House of Representatives
5	July 30, 1992	The National Energy Bill (H.R. 776)[b] is passed by the Senate
	October 1, 1992	Conference report is finished
6	October 5, 1992	House of Representatives adopts report
	October 8, 1992	Senate adopts report
7	October 24, 1992	President Bush signs the National Energy Policy Act

[a] S. 2766, 102d Cong. (1992).
[b] H.R. 776, 102d Cong. (1992).

energy policy that included electric power deregulation in 1989, it was only after the Persian Gulf crisis in the fall of 1990 that momentum developed in Congress to take up energy legislation. The first energy bills, including the Bush administration's comprehensive proposal that included electricity deregulation, were introduced in early 1991. The February 1991 leak to the press of the details of the proposed National Energy Strategy Act was the first point at which the Bush administration went public regarding its preferences for electric utility deregulation. For this reason, we use it as our first event.

Our sample consists of 78 electric utilities that are followed by Goldman, Sachs & Co. and for which we have data on costs, regulatory climate, and other firm-specific variables that are posited to generate cross-sectional differences.[23] To test hypotheses regarding the mean stock price reaction to the Act, we use the multivariate regression model developed by Katherine Schipper and Rex Thompson.[24] This methodology incorporates the contemporaneous correlation of residuals into the estimation process, while the standard event study methodology assumes that the regression residuals are independent and identically distributed. Because security returns of firms in the same industry are likely to be contemporaneously correlated because of industry commonalities, this methodology is

[23] There are 124 investor-owned utilities (IOUs) listed on the Standard and Poor's COMPUSTAT database (Standard Industrial Classification (SIC) codes 4911 or 4931). This number is reduced to 97 after eliminating utilities incorporated abroad (11) or those with missing price data, often because they are subsidiaries of other utilities already in the sample (16). Most analysts follow the same 70–80 large IOUs, which supply over three-quarters of the United States's annual power needs.

[24] Katherine Schipper & Rex Thompson, The Impact of Merger-Related Regulations on the Shareholders of Acquiring Firms, 21 J. Acct. Res. 184 (1983).

superior to the standard event study methodology.[25] To deal with time-series heteroskedasticity, we use the correction suggested by Halbert White in all our statistical inferences.[26]

We obtain daily returns for each firm in our sample, as well as daily value-weighted market returns over the period 1990–92 from the Center for Research in Security Prices (CRSP) tapes. To study cross-sectional variation in stock price reactions, we use the weighted portfolio approach proposed by Stephan Sefcik and Rex Thompson to test for the effect of each firm characteristic on stock price variations after controlling for all other relevant characteristics.[27] Specifically, if the abnormal returns of the J firms around the events of interest are hypothesized to be impacted by P characteristics, and X is a $J \times P$ matrix of these characteristics, then the set of portfolio weights W is a $P \times J$ matrix given by $(X'X)^{-1}X'$. Each row of W produces a portfolio that corresponds to only one characteristic and abstracts from the impact of all the other $P - 1$ characteristics. We compute daily portfolio returns for the P portfolios over the period 1990–92, and for each of the P portfolios, we run time-series regressions of the form

$$R_{pt} = a_p + \beta_{pm} R_{mt} + \sum_k \beta_{pk} D_{kt} + \varepsilon_{pt},$$

where R_{pt} and R_{mt} refer to the portfolio and value-weighted market returns on day t and D_{kt} equals one during the 3 days around event k and zero otherwise. For the pth portfolio, β_{pk} measures the impact of the pth characteristic on stock prices around event k.

B. *Data and Hypotheses*

We hypothesize that the impact of wholesale deregulation on utility profitability is a function of characteristics that reflect the nature of the firm's market and its competitive position in that market. In this study, we focus on the following characteristics:[28]

MARGINAL. This captures a utility's short-run incremental of generating an additional kilowatt-hour of electricity. It equals the sum of fuel expenses for steam, nuclear, hydro, and other power generation, plus the variable component of nonfuel operations and maintenance expense. Goldman, Sachs & Co. con-

[25] See G. William Schwert, Using Financial Data to Measure Effects of Regulation, 24 J. Law & Econ. 121 (1981).

[26] Halbert White, A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, 48 Econometrica 817 (1980).

[27] Stephan Sefcik & Rex Thompson, An Approach to Statistical Inference in Cross-sectional Models with Security Abnormal Returns as Dependent Variable, 24 J. Acct. Res. 316 (1986). Algebraically, the coefficient estimates obtained from this procedure are the same as those in a cross-sectional regression of abnormal returns on firm characteristics. However, inferences using the Sefcik-Thompson procedure (*id.*) are likely to be superior when security returns are clustered by industry as well as by time.

[28] Unless otherwise indicated, data are provided by Goldman, Sachs & Co.

structed this measure by aggregating the individual cost components (for example, fuel expenses) supplied by utilities in FERC's Form 1 for the year 1993.[29] In our analysis, MARGINAL is expressed as a percentage of the corresponding NERC pool average. Interconnected NERC regions form a logical starting point for defining the competitive market in which a utility belongs.[30] By using the utility's NERC region as a benchmark, we control for interregional differences in cost that might be driven by differences in technologies across regions, such as the concentration of hydroelectric power in the western United States. If cost differences across utilities are expected to be sustainable in deregulated markets, then firms with low values of MARGINAL should experience more favorable stock price reactions to deregulation events than firms with high values of MARGINAL.

FIXED. This measures a utility's fixed costs per kilowatt-hour of electricity as a percentage of the corresponding NERC pool average. Fixed costs per kilowatt-hour are defined as the nonvariable portion of operation and maintenance costs plus rate recovery of utility investment, including depreciation on generation assets and return on invested capital. These data are also based on cost information supplied by firms in FERC Form 1 for the year 1993. Variations in FIXED are primarily driven by variations in capital costs across incumbent utilities. If investors expect that capital cost advantages established under regulation will be valuable and sustainable in a deregulated market, lower values of FIXED will be associated with more positive stock price reactions. However, there are two reasons to believe that an incumbent utility's capital cost advantage over other incumbent utilities would not be valuable in a deregulated market. First, as discussed above, new technologies exist that entail significantly lower up-front capital investments than traditional technologies. The elimination of this entry barrier would uniformly hurt all incumbent utilities, even those with comparatively low capital costs. Second, in its *Entergy* decision in early 1992, FERC endorsed the general principle that utilities should be allowed to recover stranded costs that arise from open transmission access.[31] The decision by FERC was seen by some industry observers as a clear signal presaging a general policy of recovery of stranded costs resulting from deregulation, a policy that FERC did indeed adopt in 1995.[32] To the extent that investors believed that FERC would

[29] In FERC's Form 1, utilities are required to provide a variety of accounting and operating information (related to electric plant, costs, and revenues) in a standardized format to facilitate comparisons across firms.

[30] Transmission capacity *between* adjacent NERC regions is typically quite small, usually less than 5 percent of generating capacity within a region. See Wojick, *supra* note 22.

[31] Entergy Services, Inc., 58 FERC 61,234 (1992).

[32] Following the *Entergy* decision, one industry trade publication stated: "The *Entergy* decision (Docket No. ER91-569), FERC staffers and other sources said, is significant because it is a clear sign that the commission has recognized and is moving to eliminate utility fears about the consequences of open transmission access, including stranded investment, retail wheeling, and economic damage to native load." FERC: Utilities That Open up Grids Can Recoup Stranded Investment, Electric Util. Wk., March 2, 1992, at 1. In its decision, FERC was careful to note that Entergy's

allow investor-owned utilities to recover stranded costs, the value of a capital cost advantage enjoyed by one incumbent utility over another would be diminished since higher-cost utilities would be permitted to impose additional transmission surcharges or exit fees to cover the incremental capital commitments they had made in the expectation of receiving a regulatory-mandated fair rate of return.

WHOLECONTRACT. This is a measure of the costs associated with a utility's long-run commitment to purchase power from NUGs, as estimated by Resource Data International at the end of 1993.[33] Specifically, WHOLECONTRACT is the present value of the potential net costs borne by the utility as a result of the difference between long-term purchase/sales contract rates and corresponding free-market prices. We include WHOLECONTRACT in the analysis because an important source of cost differentials across incumbent utilities in the early 1990s stemmed from differences in the level of enthusiasm with which different states implemented PURPA. If a cost advantage based on purchased power contracts was expected to be valuable and sustainable in a deregulated markets, then the sign of WHOLECONTRACT ought to be negative: incumbent utilities with small commitments to purchase power at above-market rates ought to be less adversely affected by deregulation than utilities with large commitments to purchase power at above-market rates. On the other hand, to the extent that investors expect considerable new entry by firms employing efficient generation technologies, then a cost advantage based on more favorable commitments to purchase power from NUGs would not count for much. If so, variations in stock price reactions would not be associated with cross-sectional variations in WHOLECONTRACT. Similarly, an expectation that FERC would allow widespread recovery of stranded costs could also negate the impact of WHOLECONTRACT on the cross-sectional variation in stock price reactions to deregulation events.

XCAP, LXCAP. A utility's excess capacity, XCAP, is measured as discretionary firm-level excess capacity in megawatts, as a percentage of regional used capacity for 1993. It represents the excess of available capacity over a 20 percent reserve margin against average (not peak) hourly demand. With excess capacity, a utility can serve additional customers without incurring incremental costs of plant and equipment. This could benefit low-cost utilities that might want to expand operations under deregulation. To capture this effect, we include an

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eligibility for stranded cost recovery was limited by the circumstances it faced at the time of the case and that recoverable stranded costs could arise only from transmission contracts it entered into prior to 1992. By the time the 1992 Act was passed, FERC's eventual position on stranded cost recovery was probably still in doubt (for example, see Baumol & Sidak, *supra* note 11). It is fair to say, however, that investors had received some enticing hints about how FERC was likely to tilt on this issue.

[33] Resource Data International is a leader in the electric power information market. Its clients include FERC, electric utilities, industry consultants, financial institutions, and the world's largest energy resource companies.

interaction term LXCAP between marginal cost and excess capacity.[34] Specifically, LXCAP is the product of XCAP and a dummy variable that takes on a value of one for firms with MARGINAL values below the regional median and zero otherwise. Note that the sum of the coefficient on XCAP and LXCAP is the marginal impact of excess capacity for low-cost utilities, while the coefficient on XCAP is the marginal impact of excess capacity for high-cost utilities.

LEVERAGE. This is a utility's debt-asset ratio at the end of 1993 and is obtained by dividing total liabilities (Annual COMPUSTAT item 181) by total assets (Annual COMPUSTAT item 6). Since deregulation affects utility profit streams, but we measure its effect using stock return data, it is necessary to control for differences in leverage across utilities.[35] We do this by including a utility's debt-asset ratio as an explanatory variable. Controlling for other firm-specific factors, we expect that the stock price reaction to deregulation events would be less favorable the greater a utility's debt-asset ratio.[36]

INDS. This measures a utility's degree of dependence on industrial customers. Specifically, it equals the proportion of a utility's 1993 revenue derived from sales to industrial customers. We include this variable as a control in the analysis. Industrial customers are generally characterized by a relatively high price elasticity of demand for electricity. Utilities deriving a significant proportion of revenues from industrial customers would be expected to face greater competitive pressures in deregulated *retail* markets than those whose revenues depend to a lesser degree on industrial customers. To the extent that wholesale deregulation presaged a greater likelihood of retail deregulation, such utilities might therefore be expected to have less favorable reactions to deregulation events.

REG. This variable is a measure of a utility's regulatory climate. We operationalize REG using firm-level data provided by Goldman, Sachs & Co. for the period October 1991 through September 1992. Goldman, Sachs & Co. ratings range from 1 to 5, with 1 being the regulatory climate most favorable to utilities.[37] We include REG as a control variable in our analysis. If reactions to the 1992 Act were driven, in part, by the expectation that passage of the Act increased the likelihood of retail deregulation at the state level, then a utility's regulatory climate could influence stock price reactions. For example, investors might expect that regulators in "unfriendly" jurisdictions would be reluctant to compensate utilities for stranded costs arising from retail-level deregulation. If so, utilities operating in more favorable regulatory environments should experience more favorable stock price reactions to deregulation events.

In addition to the factors discussed above, we include a constant term

[34] In Tables 4–6, we also report the results of regressions with this interaction excluded.

[35] See Rose, *supra* note 4, for a discussion of this point.

[36] Beneish, *supra* note 6, found that airlines with higher debt-asset ratios were more adversely affected by industry deregulation than less leveraged airlines.

[37] We coded positive (negative) qualifiers by subtracting (adding) .25 from the numerical rating.

TABLE 3

PEARSON PRODUCT-MOMENT CORRELATIONS BETWEEN REGULATORY CLIMATE AND COMPETITIVE POSITION VARIABLES

	MARGINAL	FIXED	XCAP	WHOLECONTRACT	LEVERAGE	INDS
REG	.016	.294	.064	.060	.310	−.125
	(.887)	(.009)	(.580)	(.61)	(.006)	(.276)
MARGINAL		.025	−.002	.069	.171	−.170
		(.828)	(.985)	(.55)	(.137)	(.136)
FIXED			.209	.204	.382	−.209
			(.068)	(.08)	(.001)	(.067)
XCAP				.242	.066	.009
				(.04)	(.571)	(.935)
WHOLECONTRACT					.125	−.103
					(.280)	(.37)
LEVERAGE						−.035
						(.760)

NOTE.—Significance levels are in parentheses.

INTERCEPT to capture the mean industry stock price reaction for the seven events after controlling for relevant firm-specific factors.

Table 3 shows the correlations between the predictor variables. The correlations between REG, FIXED, and LEVERAGE are significantly positive, which suggests that utilities in more unfavorable regulatory jurisdictions are characterized by higher fixed costs and financial leverage.

V. RESULTS

In order to study the stock price implications of the events surrounding the passage of the Energy Policy Act of 1992, we examine four specifications. Our primary specification—model 4—includes all the variables listed above. Since it was unclear how the stranded-cost issue would be resolved at the time of the events associated with the passage of the Act, we exclude WHOLECONTRACT in two alternative specifications (models 1 and 2). We also present two specifications (models 1 and 3) that exclude the interaction LXCAP between marginal cost and excess capacity. To summarize then, our parsimonious specification, model 1, excludes both WHOLECONTRACT and LXCAP. Model 2 excludes just WHOLECONTRACT, while model 3 excludes just LXCAP. Model 4 is our primary specification and includes all of the predictors discussed above.

Table 4 presents the cumulative stock price reactions across all seven events for each of the four specifications. Table 5 presents cumulative stock price reactions to events 2–7. We do this because event 1 was, to some degree, special: it entailed announcement of pro-utility policies such as tax credits and interest subsidies for energy conservation that were subsequently removed from the legislation considered by the Congress. Tables 6A–6D show the reactions for each individual event for the four specifications tested.

When we include all seven events in the analysis, the INTERCEPT portfolio price reaction is positive and generally significant (p-values ranging from .02 to

TABLE 4

EFFECT OF FIRM-SPECIFIC CHARACTERISTICS ON CUMULATIVE REACTIONS TO REGULATORY EVENTS 1–7

	Model 1	Model 2	Model 3	Model 4
INTERCEPT	4.184	3.810	3.960	3.453
	(.02)	(.03)	(.05)	(.08)
MARGINAL	−.930	−.663	−.909	−.614
	(.04)	(.15)	(.05)	(.20)
XCAP	−1.409	−5.562	−1.379	−5.832
	(.41)	(.02)	(.42)	(.01)
LXCAP		5.389		5.798
		(.05)		(.04)
FIXED	.314	.208	.277	.144
	(.55)	(.69)	(.60)	(.78)
WHOLECONTRACT			−.227	−.333
			(.66)	(.53)
INDS	−1.590	−1.730	−1.721	−1.936
	(.09)	(.07)	(.07)	(.05)
LEVERAGE	−3.508	−3.009	−3.071	−2.266
	(.19)	(.25)	(.31)	(.44)
REG	−.184	−.197	−.182	−.195
	(.25)	(.21)	(.25)	(.21)

NOTE.—The table reports cumulative returns, in percentages. The p-values for the test of joint significance ($p > \chi^2$) are shown in parentheses.

.08). When we exclude event 1, INTERCEPT is positive but insignificant (p-values ranging from .21 to .30). Overall, these results suggest that investors anticipated that, at worst, wholesale deregulation would have a neutral impact on the typical incumbent utility and might even have a beneficial impact.

In light of the strong pockets of opposition the proposed legislation engendered in the U.S. electric power industry and the expectation that wholesale deregulation would accelerate momentum toward deregulation of retail electricity markets by individual states, these reactions might seem somewhat curious. But there are several plausible explanations why investors might not have reacted negatively to wholesale-level deregulation. First, although the open transmission access provisions of the 1992 Act benefited NUGs by eliminating entry barriers into wholesale power markets, the Act also made it possible for an incumbent utility to expand the scope of its wholesale power operations. In short, the Act might have threatened the rents of some incumbent utilities, but it probably created opportunities for increasing rents by others. On balance, at the time the legislation was being considered, it was probably not obvious whether the average utility would benefit from or be harmed by the 1992 Act. In addition, as noted earlier, FERC had sent strong signals in 1992 that it was inclined to take a favorable stance (from a utility's point of view) on the issue of stranded cost recovery. Thus, even if the 1992 Act might have been expected to have inherently unfavorable consequences on the typical incumbent utility, investors might well have expected that FERC's implementation of the Act would minimize the damage

TABLE 5

EFFECT OF FIRM-SPECIFIC CHARACTERISTICS ON CUMULATIVE REACTIONS TO REGULATORY EVENTS 2–7

	Model 1	Model 2	Model 3	Model 4
INTERCEPT	1.945	1.562	2.150	1.678
	(.21)	(.30)	(.19)	(.29)
MARGINAL	−.961	−.688	−.978	−.703
	(.03)	(.12)	(.03)	(.14)
XCAP	−1.764	−6.021	−1.792	−5.933
	(.28)	(.01)	(.28)	(.01)
LXCAP		5.525		5.392
		(.05)		(.05)
FIXED	.099	−.010	.133	.011
	(.83)	(.98)	(.77)	(.98)
WHOLECONTRACT			.208	.109
			(.64)	(.81)
INDS	−2.301	−2.443	−2.178	−2.378
	(.00)	(.00)	(.00)	(.00)
LEVERAGE	−.437	.075	−.837	−.084
	(.85)	(.97)	(.74)	(.95)
REG	−.103	−.116	−.105	−.117
	(.40)	(.34)	(.38)	(.33)

NOTE.—The table reports cumulative returns, in percentages. The p-values for the test of joint significance ($p > \chi^2$) are shown in parentheses.

that competition would impose on utilities that had made large capital or purchased power commitments to support long-term contractual transactions with wholesale customers.

We should note that our results on INTERCEPT differ from the findings of a recent study by Mark Johnson, Marcia Niles, and Stacey Suydam.[38] This study finds a negative mean reaction to events associated with the passage of the Energy Policy Act of 1992 for the sample of 68 utilities they analyze. However, our analysis differs in two important ways from their study (aside from a larger sample size). First, our analysis identifies the mean reaction for our sample of firms after controlling for the effect of firm-specific characteristics such as MARGINAL that are hypothesized to affect stock price reactions. By contrast, the analysis of Johnson, Niles, and Suydam does not include firm-specific characteristics. Second, our methodology controls for clustering by industry and time. By contrast, Johnson, Niles and Suydam use a standard event-study methodology that does not control for contemporaneous correlations in error terms.

Turning now to the effects of utility-specific characteristics, we find that investor reactions to deregulation events seem to be influenced by a utility's marginal-cost position. In the regressions (models 1 and 3 in Tables 4 and 5) in which we exclude an interaction with excess capacity, the sign of MARGINAL

[38] Mark S. Johnson, Marcia S. Niles, & Stacey L. Suydam, Regulatory Changes in the Electric Utility Industry: Investigation of Effects on Shareholder Wealth, 17 J. Acct. & Pub. Pol'y 285 (1998).

TABLE 6

EFFECT OF FIRM CHARACTERISTICS ON PRICE REACTIONS TO EVENTS PRECEDING THE PASSAGE OF THE ENERGY POLICY ACT OF 1992

A. MODEL 1

Event[a]	INTERCEPT	MARGINAL	XCAP	FIXED	INDS	LEVERAGE	REG
1	22.387	.315	3.544	2.148	7.103	−30.710	−.809
	(2.57)**	(.26)	(.87)	(.78)	(1.13)	(−2.79)**	(−.80)
2	−5.009	−2.442	−1.159	1.339	−1.278	12.967	−.733
	(−.84)	(−1.45)	(−.15)	(.69)	(−.94)	(2.02)*	(−1.31)
3	−4.990	.067	1.418	−1.059	2.118	8.900	−.187
	(−1.23)	(.08	(.47)	(−.84)	(1.08)	(1.91)*	(−.58)
4	.784	−2.968	−.823	2.805	−1.214	−4.266	.487
	(.10)	(−1.72)	(−.14)	(2.02)*	(−1.45)	(−.45)	(2.40)**
5	30.069	−2.856	−6.659	−1.325	−17.900	−33.870	.255
	(3.28)**	(−6.75)**	(−.89)	(−.44)	(−5.53)**	(−1.98)*	(.31)
6	−10.222	−.105	−8.989	−.032	1.708	15.092	.083
	(−2.60)**	(−.20)	(−.97)	(−.04)	(.45)	(2.49)**	(.24)
7	8.822	−1.309	−1.426	−.734	−6.439	−3.193	−.933
	(3.50)**	(−.40)	(−.46)	(−.46)	(−1.88)	(−.45)	(−2.42)**

NOTE.—All reported coefficients have been multiplied by 1,000 for reporting convenience. The t-statistics are in parentheses and are computed using White standard errors.

[a] Events are described in Table 1.

* Significant at the .05 level or better, two-tailed tests.

** Significant at the .01 level or better, two-tailed tests.

is negative and significant. This is the case whether we consider cumulative reactions to all seven events or concentrate only on events 2–7. The addition of the interaction term LXCAP attenuates the significance of MARGINAL as one might expect: MARGINAL continues to be negative in these regressions, but its p-value generally ranges between .15 and .20. However, in regressions with the interaction terms, results on the MARGINAL portfolio must be interpreted together with the results on excess capacity. Recall that the coefficient of XCAP captures the impact of excess capacity on the reactions of high-cost utilities, while the sum of XCAP and LXCAP measures the impact of excess capacity on the reactions of low-cost utilities. In the specifications with interactions (models 2 and 4 in Tables 4 and 5), the XCAP cumulative reactions are significantly negative. Thus, ceteris paribus, high-cost firms experienced significantly more unfavorable reactions to deregulation events the higher their excess capacity. However, the cumulative reaction of the XCAP and LXCAP portfolios is significantly positive. This indicates that low-cost firms experienced more favorable stock price reactions the more excess capacity they had. When taken together with the results on the MARGINAL portfolio, these findings support the hypothesis that investors expected low-marginal-cost utilities (and especially those that currently have excess capacity) to enjoy valuable and sustainable cost advantages in deregulated markets.

These results are broadly in line with our expectations. The most important driver of differences in marginal cost in the electric power industry are differences

TABLE 6 (*Continued*)

B. MODEL 2

Event[a]	INTERCEPT	MARGINAL	XCAP	LCXCAP	FIXED	INDS	LEVERAGE	REG
1	22.482	.248	4.590	−1.358	2.174	7.137	−30.836	−.806
	(2.54)**	(.21)	(.92)	(−.37)	(.79)	(.13)	(−2.74)**	(−.80)
2	−4.501	−2.804	4.473	−7.310	1.484	−1.090	12.29	−.716
	(−.83)	(−1.38)	(2.04)*	(−.84)	(.71)	(−.70)	(2.14)*	(−1.23)
3	−6.561	1.188	−16.019	22.630	−1.506	1.537	10.997	−.242
	(−1.37)	(1.78)	(−2.09)*	(2.12)*	(−1.41)	(.76)	(1.99)*	(−.70)
4	−2.010	−.974	−31.828	40.238	2.010	−2.247	−.539	.390
	(−.25)	(−.61)	(−19.29)**	(6.05)**	(1.32)	(−2.40)**	(−.05)	(2.08)*
5	32.379	−3.078	−3.217	−4.466	−1.236	−17.800	−34.283	.266
	(3.58)**	(−2.81)**	(−.19)	(−.23)	(−.45)	(−4.80)**	(−2.19)*	(.34)
6	−10.967	.427	−17.260	10.734	−.244	1.432	16.087	.057
	(−2.89)**	(.59)	(−1.73)	(1.52)	(−.29)	(.37)	(2.76)**	(.17)
7	9.279	−1.635	3.642	−6.577	−.604	−6.270	−3.803	−.917
	(2.98)**	(−.53)	(.45)	(−.67)	(−.38)	(−1.84)	(−.48)	(−2.26)*

NOTE.—All reported coefficients have been multiplied by 1,000 for reporting convenience. The *t*-statistics are in parentheses and are computed using White standard errors.
[a] Events are described in Table 1.
* Significant at the .05 level or better, two-tailed tests.
** Significant at the .01 level or better, two-tailed tests.

in fuel costs, and these differences are sensitive to locational differences among utilities. Superior locations are more likely to be hard to imitate than other cost drivers, such as the type of generation technology employed by the firm, and so an advantage that shows up in the form of lower marginal cost might well be expected to hold its value in a deregulated market.

While stock price reactions vary cross-sectionally with MARGINAL to a significant degree, they do not vary significantly with FIXED or WHOLECONTRACT. The coefficient of WHOLECONTRACT is generally negative but insignificant. Similarly, the coefficient on FIXED is also almost always insignificantly different from zero. The one exception is the results in Table 4, where FIXED was significantly positive at the 10 percent level. Overall then, utilities with lower fixed costs or more favorable contractual commitments for purchasing power were not expected by investors to be especially insulated from the adverse effects of deregulation or especially favored by the opportunities it might have presented. This is broadly consistent with the characterization of industry economics described by White.[39] The emergence of new gas-turbine-based generation technologies coupled with declines in the price of natural gas reduced the absolute capital requirements associated with entering the business of generating electricity. An incumbent utility that enjoyed an advantage over other incumbents simply because it had lower fixed costs owing to a smaller proportion of nuclear power plants in its technology would probably be just as vulnerable to competitive threats from new entrants as an incumbent that had unwisely invested in sig-

[39] *Supra* note 1.

TABLE 6 (*Continued*)

C. MODEL 3

Event[a]	INTERCEPT	MARGINAL	XCAP	FIXED	INDS	LEVERAGE	WHOLE-CONTRACT	REG
1	18.101	.691	4.131	1.427	4.573	−22.348	−4.346	−.772
	(1.66)	(.64)	(1.04)	(.53)	(.68)	(−1.40)	(−1.65)	(−.76)
2	−6.036	−2.352	−1.018	1.166	−1.884	14.972	−1.042	−.724
	(−1.37)	(−1.27)	(−.13)	(.56)	(−.83)	(4.94)**	(−.54)	(−1.33)
3	−4.132	−.000	1.301	−.915	2.624	7.227	.870	−.194
	(−1.60)	(−.01)	(.45)	(−.60)	(1.15)	(3.48)**	(.56)	(−.50)
4	.068	−2.905	−.725	2.684	−1.636	−2.870	−.726	.494
	(.01)	(−1.69)	(−.13)	(2.26)*	(−3.53)**	(−.38)	(−.49)	(2.57)**
5	31.735	−3.002	−6.887	−1.045	−16.900	−37.120	1.689	.240
	(2.71)**	(−4.91)**	(−.88)	(−.35)	(−6.48)**	(−1.73)	(.63)	(.29)
6	−9.736	−.147	−9.056	.050	1.994	14.146	.492	.079
	(−2.12)*	(−.27)	(−.97)	(.05)	(.53)	(1.87)	(.40)	(.23)
7	9.604	−1.377	−1.533	−.602	−5.977	−4.720	.794	−.940
	(2.76)**	(−.41)	(−.53)	(−.44)	(−2.36)*	(−.84)	(.50)	(−2.48)**

NOTE.—All reported coefficients have been multiplied by 1,000 for reporting convenience. The *t*-statistics are in parentheses and are computed using White standard errors.
[a] Events are described in Table 1.
* Significant at the .05 level or better, two-tailed tests.
** Significant at the .01 level or better, two-tailed tests.

nificant amounts of nuclear capacity in the past. And even if the lower-fixed-cost incumbent might have been inherently less vulnerable than the higher-fixed-cost incumbent, FERC's pronouncements on the issue of stranded costs had been sufficiently pro-utility throughout much of 1992 that utilities with high stranded costs (which are generally positively correlated with FIXED) might not have expected wholesale deregulation to pose much of a threat to their financial prospects.

With respect to the other utility-specific variables—INDS, LEVERAGE, and REG—only INDS is statistically significant. Specifically, the coefficient on INDS is negative and significant at levels ranging from .05 to .09. Thus, the greater a utility's reliance on industrial customers, the less well investors expected it to fare after wholesale-market deregulation. As discussed above, one reason that a utility's mix of retail customers might affect reactions to a law that restructured the wholesale market would be that reactions to the 1992 Act included expectations of how utilities would fare in unregulated retail markets as well as wholesale markets. This explanation is plausible because, as discussed above, at the time of its passage, the 1992 Act was widely viewed as a harbinger of regulatory reform at the state level.

For each specification tested, Table 6 presents stock price reactions to each of the seven acts individually. Results indicate that the significantly negative reaction of the MARGINAL and INDS portfolios are generally driven by events 4 and 5, the passage of the Energy Policy Act in the House of Representatives and the Senate.

TABLE 6 (*Continued*)

D. MODEL 4

Event[a]	INTERCEPT	MARGINAL	XCAP	LCXCAP	FIXED	INDS	LEVERAGE	WHOLE-CONTRACT	REG
1	17.746	.898	1.012	4.061	1.334	4.426	−21.828	−4.421	−.781
	(1.56)	(.89)	(.15)	(.61)	(.49)	(.64)	(−1.30)	(−1.61)	(−.77)
2	−5.496	−2.667	3.721	−6.171	1.307	−1.660	14.183	−.929	−.710
	(−1.56)	(−1.14)	(1.25)	(−.57)	(.57)	(−.62)	(7.18)**	(−.44)	(−1.25)
3	−6.063	1.120	−15.643	22.060	−1.418	1.822	10.049	.465	−.244
	(−1.82)	(1.46)	(−2.28)*	(2.43)**	(−1.06)	(.82)	(3.52)**	(.33)	(−.70)
4	−3.615	−.754	−33.040	42.074	1.725	−3.166	2.513	−1.498	.398
	(−.51)	(−.50)	(−17.33)**	(7.71)**	(1.32)	(−7.93)**	(.34)	(−1.06)	(2.20)*
5	32.320	−3.344	−1.751	−6.687	−.892	−16.700	−37.975	1.812	.255
	(2.88)**	(−2.80)**	(−.11)	(−.36)	(−.35)	(−5.08)**	(−1.90)	(.69)	(.33)
6	−10.644	.383	−17.015	10.364	−.187	1.617	15.472	.302	.056
	(−2.43)**	(.54)	(−1.78)	(1.71)	(−.21)	(.43)	(2.14)*	(.26)	(.17)
7	10.281	−1.772	4.399	−7.724	−.426	−5.696	−5.708	.935	−.923
	(2.47)**	(−.53)	(.50)	(−.76)	(−.34)	(−2.35)*	(−.84)	(.57)	(−2.30)*

NOTE.—All reported coefficients have been multiplied by 1,000 for reporting convenience. The *t*-statistics are in parentheses and are computed using White standard errors.
[a] Events are described in Table 1.
* Significant at the .05 level or better, two-tailed tests.
** Significant at the .01 level or better, two-tailed tests.

VI. CONCLUSION

The Energy Policy Act of 1992 provided the impetus for the deregulation of the electric utility industry. In this paper, we study how firm-specific characteristics shaped investor reactions to the legislative events associated with the passage of this Act. In light of wide differentials in cost positions of electric utilities that prevailed at the time of the Act, we explored what categories of cost advantages investors expected to be valuable and sustainable in postderegulated markets. Our key empirical findings are as follows:

1. Controlling for firm-specific factors, we find that the overall mean price reaction to legislative events preceding the passage of the 1992 Energy Policy Act is at worst insignificantly different from zero and perhaps even significantly positive. Our event study revealed no evidence that investors expected the typical utility to be harmed by the deregulation of wholesale markets.

2. Utilities with low marginal costs experienced more favorable stock price reactions to deregulation events than did utilities with high marginal costs. This cost advantage effect was significantly pronounced, however, for utilities with excess capacity. This evidence suggests that investors expected that the marginal-cost advantages of incumbent utilities would be valuable and sustainable in deregulated markets. This finding quite possibly reflects the strong isolating mechanism that protects an incumbent utility with lower-than-average marginal costs: superior locations that give it access to fuel at lower cost.

3. In contrast to marginal costs, incumbent's advantages based on fixed costs

or purchased power commitments were not seen by investors as conveying any special advantage in deregulated markets. This could reflect the impact of technological change: in a deregulated market entrants would be able to adopt new technologies that entail significantly lower capital costs than traditional generation technologies. In light of this substitution possibility, existing capital-cost or purchase-power advantages of an incumbent firm might not be expected to count for very much. Reinforcing this effect, investors might have realistically expected that FERC would take a rather generous posture on stranded costs that would further neutralize the fixed-cost disadvantages an incumbent utility might face in a deregulated market.

The fact that overall reactions to the 1992 Act were, at best, neutral and maybe even positive for the average utility raises the interesting possibility that stock price reactions might have been driven by an expectation that FERC would uphold its end of an implicit regulatory contract and allow utilities to recover their stranded costs. The fact that FERC eventually adopted this policy adds some credence to this conjecture.[40] Unfortunately, the magnitude of stranded costs put at risk by the onset of wholesale deregulation as well as difficulties associated with measuring wholesale stranded costs make it difficult to test directly whether investors expected FERC to uphold an implicit regulatory bargain. In future work, therefore, we intend to examine investor reactions to state-level deregulation initiatives to explore whether investors expected regulators to allow firms to recover the large retail-level stranded costs that would be created by deregulation of retail markets. The experience in California in 1994 (enormous drops in the market value of the three California investor-owned utilities) suggests that investors might have been rather pessimistic about the prospects for stranded cost recovery. Our preliminary analysis of the California data suggests, however, that the negative stock price reactions might have been driven more by pessimism about the high operating costs of the California utilities than by stranded costs per se. A careful sorting out of the impact of stranded costs and various categories of firm-specific cost advantages is a natural extension of the empirical work presented in this paper.

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[40] For an excellent discussion of the regulatory contract and for an interpretation of the 1992 Act and FERC's subsequent implement of open transmission access in terms of this contract, see J. Gregory Sidak & Daniel F. Spulber, Deregulatory Takings and the Regulatory Contract: The Competitive Transformation of Network Industries in the United States (1997).

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