The economic consequences of regulatory accounting in the nuclear power industry: market reaction to plant abandonments

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Abstract

Between 1972 and 1990, US electric utility companies cancelled orders for 117 nuclear power plants (NEI, 1996, pp. 1–6). The regulatory accounting methods adopted by utility rate setting commissions determined whether utilities could recover the losses on cancelled plants through higher rates. In effect, the choice of accounting methods determined how billions of dollars invested in cancelled nuclear plants was allocated between utility stockholders, ratepayers, and taxpayers (DOE/EIA, 1983, pp. ix–x). Our paper examines the economic consequences to stockholders of capital project abandonments in a regulated industry. The results show that while regulatory treatment of abandonment costs was generally favorable to investors, the market reacted negatively to nuclear project abandonment announcements indicating that investors did not expect to fully recoup abandonment losses. Two stage regression is used to investigate the determinants of the market’s reaction to project cancellations. © 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

The United States (US) nuclear power industry ran into great difficulties in the late 1970s. Electric utilities ordered 231 nuclear plants before the end of 1974, while only 15 construction orders were placed after 1974 (Campbell, 1988, 208–209).
p. 3). No nuclear plants have been ordered since 1978 (Campbell, 1988, p. 3). Between 1972 and 1990, electric utilities in the US cancelled construction orders on 117 planned nuclear power plants (NEI, 1996, pp. 1–6), abandoning plans to construct approximately half of the country’s projected nuclear capacity (DOE/EIA, 1983, pp. ix–x). From an accounting perspective, the difficulties of the nuclear power industry is of interest because regulatory accounting policy was instrumental in determining who bore the costs of abandoned nuclear power projects. Accounting methods adopted by state utility rate setting commissions determined how billions of dollars (DOE/EIA, 1983, pp. ix–x) invested in cancelled nuclear projects was allocated between financial stakeholders, including utility stockholders, ratepayers and federal taxpayers. ²

Our study examines the economic consequences of regulatory accounting policy with respect to the shareholders upon announcement of nuclear project cancellations. We extend the prior research by Chen et al. (1987). Chen et al. (1987, pp. 290–291) found no significant market reaction to nuclear project abandonment announcements in the period 1974–1982 consistent with the theory that regulated utilities expected to be compensated for abandonment losses in rate adjustments. A partitioning of the sample into two periods, however, found significant negative excess returns associated with the announcement of nuclear power project abandonments in the period (1974–1978) prior to the Three Mile Island (TMI) nuclear accident in 1979, while significant positive excess returns were found in the post-TMI period (1979–1982) (Chen et al., 1987, pp. 291–292). Chen et al. (1987, p. 293–294) attribute this result to changing investor expectations concerning the regulatory treatment of abandonment costs. Specifically, Chen et al. (1987, pp. 293–294) suggest that after 1979 regulatory rulings allowing abandonment losses to be passed to, or at least shared by ratepayers, made “abandonments more palatable to investors,” and in conjunction with increased perceptions of risk resulting from the TMI accident led investors to react positively to abandonment announcements. Chen et al. (1987) leaves several empirical questions unanswered regarding the interactions between regulatory accounting policies and the economic consequences to stockholders of nuclear project abandonments. To what extent did utility regulators compensate investors for abandonment losses by rate adjustments? Did investors expect to be fully compensated for abandonment losses? How did investors’ expectations about the regulatory treatment of abandonment losses affect the market’s reaction to abandonment announcements?

Our study addresses these questions by describing the regulatory accounting environment, analyzing how public service commissions treated the cost of cancelled nuclear projects for rate setting purposes, and examining how alternative regulatory accounting rulings allocated losses on abandoned nuclear

² The US Department of Energy (DOE/EIA, 1983, p. x) estimated that $10 billion was invested in the 100 nuclear power plants cancelled between 1972 and 1982 alone.
projects and altered the distribution of cash flows among ratepayers, taxpayers and utility owners. Our review of regulatory commission decisions shows that although regulatory treatment of abandonment costs was generally favorable to investors, shareholders could not expect to be fully compensated for abandonment losses through rate adjustments. Accordingly, our study hypothesizes that investors will react negatively to abandonment announcements. This hypothesis is supported by empirical tests that indicate the stock market reacted negatively to nuclear project cancellation announcements over the period 1972–1987. Supplemental tests indicate that the negative market reaction is associated with investment size. Tests of the relationship between abandonment announcements and state-specific prior regulatory rulings yield mixed results.

2. The regulatory environment

Accounting choices are said to have economic consequences if the changes in the rules used to calculate accounting numbers alter the distribution of firm’s cash flows or the wealth of parties that use accounting numbers for contracting and decision making (Holthausen and Leftwich, 1983, p. 7). The cash flow consequences of accounting policy choices, in turn, explain interest group preferences for particular accounting policies and the intrusion of interest group politics in the accounting standard setting process (Zeff, 1978, pp. 56–57). By calling attention to the conflicts of economic interest inherent in the choice of accounting methods, the literature on the economic consequences of accounting has helped to dispel the idea that accounting choices are neutral or disinterested.

A substantial body of economic consequences research (Ball and Smith, 1992; Burgstahler and Dichev, 1997; DeAngelo et al., 1994; Hand and Skantz, 1997; Healy, 1985, Muller, 1999; Soo, 1999) has focused on explaining discretionary accruals and accounting policy choices adopted by firms. The literature acknowledges that government regulation (Holthausen and Leftwich, 1983, pp. 85–86) and political costs (Watts and Zimmerman, 1978, pp. 115–116) have cash flow consequences, and empirical studies (Han and Wang, 1998, p. 116; Key, 1997, p. 334) have found a relationship between firms’ choice of accounting policies and political costs. Recent accounting research on regulated industries, has shown that the threat of regulatory costs affects firm value in the oil industry (Patten and Nance, 1998, pp. 426-427) and that bank managers’ discretionary accruals are influenced by regulatory changes (Kim and Kross, 1998, p. 97). With respect to the electric utilities industry, Johnson et al. (1998, p. 285) found that moves toward deregulation have had negative effects on utilities stock prices, particularly for utilities with heavy investments in nuclear power. D'Souza (1998, p. 387) found that managers of rate-regulated firms that face greater uncertainties about further rate recoveries have greater
incentives to use discretionary choices that intensify the impact of expense-increasing accounting changes. The economic consequences research, however, has focused primarily on management’s discretionary policy choices or the impact of regulatory changes on stock prices. With the exception of tax research (Callihan, 1994), relatively little prior empirical research has examined the economic consequences of accounting policies used by state regulators.

The nuclear power industry provides a context for examining the cash flow consequences of regulatory accounting decisions made by public agencies, in this case by state electric utility rate setting commissions. Electricity rates in the US are regulated by public service commissions established within each of the fifty states (Campbell, 1988, p. 94). The accounting methods adopted by public service commissions have direct cash flow consequences for utility investors since regulatory accounting is the basis for determining the rates electric utilities can charge customers. Rates are set to cover allowable expenses and enable investors to earn a specified return on assets (Campbell, 1988, pp. 197–198). For rate setting purposes, both allowable expenses and assets (i.e., the rate base) are measured on an accrual accounting basis with public service commissions prescribing allowable accounting methodologies (Otis, 1981, pp. 161–163). Because utility rates are set by state commissions, the nuclear power industry represents a sector of the US economy where distributions of economic wealth depend extensively on state actions and institutions, as well as market forces.

The history of nuclear power in the US has been highly volatile as the economic, technical and political feasibility of nuclear power generation was called into question in the 1970s (Campbell, 1988, pp. 3–10). A sharp decrease in demand in the mid-1970s coincided with rising concerns over nuclear safety dramatized by the nuclear accident at TMI in 1979 (Campbell, 1988, pp. 5, 8). Increasingly stringent government safety standards and an active anti-nuclear movement combined to delay plant construction and increase costs (Campbell, 1988, pp. 73–91). By the end of the decade, utility bond ratings plummeted, capital market financing for nuclear projects dissipated and the industry ran into great difficulties (Campbell, 1988, pp. 92–109). Against this background, public service commissions at the state level grappled with the decision of whether and to what extent the costs of abandoned nuclear projects should be passed on to utility ratepayers or absorbed by utility owners (DOE/EIA, 1983, pp. 33–57). The outcomes to those decisions could not be easily predicted for three reasons.

First, the institutional structure of utility rate setting in the US is fragmented and decentralized. Each of the fifty states has its own rate setting commission with each commission facing a slightly different local constituency and array of organized interests including industry and consumer lobbies (Campbell, 1988, pp. 92–109). Against this background, public service commissions at the state level grappled with the decision of whether and to what extent the costs of abandoned nuclear projects should be passed on to utility ratepayers or absorbed by utility owners (DOE/EIA, 1983, pp. 33–57). The outcomes to those decisions could not be easily predicted for three reasons.

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For examples of prior research on regulatory accounting choices and the importance of the state and regulatory accounting practices within capitalist economies see Arnold (1991), Burchell et al. (1980), Cooper and Sherer (1984) and Jarrell (1979).
To the extent that regulators act as self-interested utility maximizers (Stigler, 1971, p. 11; Peltzman, 1976, p. 214) seeking re-appointment, re-election, and/or future employment in a regulated industry, the incentives facing commissioners vary according to state-specific organizational and environmental variables such as whether commissions are appointed or elected, term length, state politics, anti-nuclear activism, and media attention.

Second, the economics and politics of nuclear power, itself, was changing so that regulatory commissions faced a substantially different socio-economic climate in the late 1970s and 1980s. Anti-nuclear activism in the 1980s was increasingly directed at state public service commissions and economic issues (Campbell, 1988, pp. 73–91). After 1976 anti-nuclear groups began pressuring state public service commissions not to approve new projects until the federal government built a nuclear waste depository arguing that project costs could not be determined until the waste issue was resolved (Campbell, 1988, p. 86). As Campbell (1988, p. 76) indicates, a 1971 federal court ruling preventing state and local governments from superseding the rules and regulations of federal nuclear regulatory agencies prompted opponents of nuclear power to rephrase their arguments in economic, rather than safety terms, and to present them before state public service commissions. The intrusion of nuclear opposition politics into the rate setting process further politicized the regulatory environment (Campbell, 1988, pp. 73–91).

Finally, the technical complexity of the rate setting process allows for deviations between stated policies and practical consequences. Although rate setting commissions often adopted the policy objective of allocating costs equitably between ratepayers, taxpayers, and utility owners, slight variations in elected accounting methods could skew the distributions of cash flows in favor of one group or another. Moreover, a ruling on nuclear abandonment costs that was favorable or unfavorable to a particular interest group could be offset by seemingly unrelated decisions such as an adjustment in the allowable rate of return. In sum, utility rate setting constitutes an arena where public policy is difficult to decipher because it is implemented through complex accounting technicalities that can obscure the cash flow consequences of rate rulings.

Because of the complexity of government decision processes, the contradictory nature of the state, and the political volatility of the nuclear power industry, hypotheses about the economic consequences of regulatory accounting policy cannot be easily formulated on the basis of state theories alone. Research in government accounting (Cheng, 1994) has shown that, as

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with other public policy decisions, public sector accounting choices are the outcome of complex political processes involving interactions between individual actors (e.g., elected officials, agency administrators and staff, media, credit markets, taxpayers, and interest groups) constrained by socioeconomic conditions, technical capacity, and political and bureaucratic structures. As the following section demonstrates, hypotheses regarding the consequences of state interventions in the nuclear power industry require a concrete historical analysis of the regulatory rulings and the technical accounting choices that determined the cash flow consequences of nuclear plant abandonment decisions.

3. The cash flow consequences of regulatory accounting policy

To determine how public service commissions treated the cost of abandoned nuclear plants for rate setting purposes, we analyzed data on the major public utility commission and court rulings made between 1976 and 1987. The results are summarized in Table 1.

Table 1 classifies the accounting methods specified in 116 final regulatory commission and appellate court rulings issued between 1976 and 1987 into three categories: no recovery; full recovery, and partial recovery. Similar categories were used in prior research (DOE/EIA, 1983, p. 39) to classify regulatory outcomes into three types of recovery methods. Each of the three recovery methods results in a different allocation of costs between stockholders, ratepayers, and taxpayers. The frequency and cash flow effect of the three types of recovery methods are described below.

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5 Data on regulatory commission rulings on the treatment of cancelled plants was obtained from a Regulatory Research Associates, Inc. (RRA) report entitled Utility Composite – Cancelled Plant Treatments (1988). This report was purchased for research purposes and is cited with permission from the Regulatory Research Associates, Inc. The report provides a tabular listing detailing regulatory decisions on treatment of cancelled nuclear plants issued by state commissions and/or state courts through 1987. While the listing attempts to be all-inclusive with respect to the state regulatory treatment of cancelled plant recovery, the report notes that some occurrences may have been omitted, particularly where plants were cancelled in the planning phase and only minor amounts of sunk costs were involved (RRA, 1988, p. 1).

6 The major components of costs of abandoned nuclear projects, as defined for rate setting purposes, are capitalized Construction Work in Progress (CWIP) and Allowance for Funds Used During Construction (AFUDC). Other components of cost include contract cancellation penalties and site shutdown costs, less salvage value. CWIP includes cumulative cash expenditures to the date of cancellation (e.g., land acquisition; site improvements; construction labor, materials and equipment; engineering and environmental studies; and, costs to acquire licenses and permits). AFUDC is the carrying cost of capital on funds used during the construction period (DOE/EIA, 1983, pp. 33–38).
3.1. No recovery

In 25 cases (21.6%), regulatory commissions or the courts ruled that none of the costs of abandoned nuclear projects could be passed to ratepayers. When recovery is not allowed, losses on abandoned nuclear projects are shared between utility stockholders and taxpayers. Taxpayers share part of the costs because utilities can write-off the cost of their investment in abandoned projects as an extraordinary loss for income tax purposes in the year of the cancellation, thereby shifting part of their loss to taxpayers. Assuming a 50% tax rate, no recovery rulings allocate half the abandonment costs to utility owners and half to federal taxpayers (DOE/EIA, 1983, p. 40).

3.2. Full recovery

In 21 cases (18.1%), regulatory commissions allowed full recovery. Under the full recovery method, utility stockholders recover the full cost of prudent investments in cancelled nuclear projects (DOE/EIA, 1983, pp. 39–40). Costs are amortized over a period of years, resulting in rate increases that gradually return the full amount of capital invested in cancelled projects to utility owners. In addition, rates are set to allow utilities to earn a return on the unamortized balance of their investment (i.e., the unamortized investment is included in the rate base). Utility owners, thus, recover their original capital investment, and earn a return on invested capital for the time it is committed (DOE/EIA, 1983, pp. 39–40).

Taxpayers benefit from the full recovery method because the initial write-off of abandonment costs is recovered over the amortization period via taxes paid on the incremental revenues resulting from rate increases imposed to recover abandonment costs (DOE/EIA, 1983, pp. 39–40). Since income taxes

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Table 1
Regulatory accounting for the cost of canceled nuclear power plants in 116 Final Commission and Court Rulings (1976–1987)

<table>
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<tr>
<th>Recovery of investment</th>
<th>Return on balance</th>
<th>No</th>
</tr>
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<tbody>
<tr>
<td>Yes</td>
<td>Full Recovery</td>
<td>Partial Recovery</td>
</tr>
<tr>
<td>21 Cases (18.1%)</td>
<td>70 Cases (60.3%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No Recovery</td>
<td>25 Cases (21.6%)</td>
</tr>
</tbody>
</table>

*Full Recovery allows utility owners to recover original capital invested and earn a return on the unamortized balance of their investment. Partial Recovery allows utilities a return of all or part of the capital invested, but no return on the unamortized balance of their investment. No Recovery allows none of the costs of abandoned projects to be recovered by rate increases. (Source: Data on regulatory commission ruling on the treatment of cancelled plants was obtained from RRA (1988). See footnote 5.)
are part of a utility’s service cost, they are built into rates and ultimately paid by ratepayers (DOE/EIA, 1983, pp. 39–40). Taxpayers do, however, share part of the cost of abandonment due to the cash flow consequences of deferred tax revenues. Since tax revenues are lost in the year of the abandonment and only gradually recouped over the amortization period, taxpayers effectively pay the capital cost resulting from deferred revenues (DOE/EIA, 1983, p. 41). In effect, the full recovery method allocates cost between ratepayers and taxpayers while utility stockholders bear no costs (DOE/EIA, 1983, pp. 39–40).

3.3. Partial recovery

Most state regulatory commissions allowed partial recovery of abandonment costs. The Federal Energy Regulatory Commission (FERC), the federal agency that regulates inter-state wholesale electricity rates also adopted a partial recovery policy in 1979. Under partial recovery investors receive a return of, but no return on their investment. Although there are several variants of partial recovery methodologies (DOE/EIA, 1983, pp. 40–41), partial recovery, as it is used here, includes any method that returns all or part of the costs invested in abandoned nuclear projects to investors through periodic amortization charges which increase electricity rates, but does not allow investors to earn a return on the unamortized balance (DOE/EIA, 1983, p. xiv). In other words, all prudently incurred costs invested in abandoned nuclear projects were returned to investors through periodic amortization charges which increased electricity rates (DOE/EIA, 1983, p. xiv). But, the unamortized investment in cancelled plants was excluded from the rate base (DOE/EIA, 1983, p. xiv). Consequently, investors did not earn a return on their investment during the amortization period (DOE/EIA, 1983, p. xiv). The partial recovery method was adopted in 70 (60.3%) of the regulatory commission rulings and court cases between 1976 and 1987 (RRA, 1988, pp. 2–5). Amortization periods ranged from 2 to 20 years with 10 years being most common (RRA, 1988, pp. 2–5).

The Energy Information Administration conducted a simulation study for the Department of Energy (DOE/EIA, 1983, pp. xv–xvii) to determine how the partial recovery methodology distributed costs between ratepayers, utility shareholders and taxpayers. The results of the DOE/EIA study comparing the

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7 The method described above was established by the FERC in Opinion No. 49 (8 FERC ¶ 61,054) and remained in effect until 1988. On January 15, 1988 the FERC issued Opinion No. 295 (42 FERC ¶ 61,016) which granted utility owners full recovery of and on 50% of their investment in cancelled nuclear plants, and no recovery on the other 50% (42 FERC ¶ 61,016 at p. 61,068).
present value of cash flows available to ratepayers, stockholders and taxpayers under the partial recovery method are summarized in Table 2. As Table 2 shows, the distribution of cash flows to each of the three stakeholders is affected by the length of the amortization period. The DOE/EIA (1983, p. xvi) simulations reported that the partial recovery method, with an amortization period of 10 years, allocated 30% of the costs to ratepayers; 28% of the costs to utility owners; and 42% of the costs to federal taxpayers. The longer the amortization period, the greater the costs borne by utility investors who earned no return on the unamortized balance of their investment during the amortization period. For example, as Table 2 shows, the designation of a 5 versus a 20 year amortization period could double stockholders’ share of abandonment losses (from 19% to 38%).

In addition to amortization periods, cash flows were also affected by prudence determinations (Teisberg, 1988, p. 9). Under the full recovery and partial recovery methods, investors were allowed to recover only the costs of prudent investments (DOE/EIA, 1983, p. 39). If a regulatory commission determined that a utility acted imprudently in making its nuclear investment decisions, the utility was not allowed to amortize the cost of its investment. Imprudence determinations resulted in partial denials of recovery (Teisberg, 1988, pp. 11–12). Commissions sometimes ruled that the original investment decision was prudent, but that utilities had continued investing in the nuclear plants beyond the point when the prudent decision would have been to abandon the project (DOE/EIA, 1983, p. 39). Recovery was denied for some portion of the

<table>
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<th>Amortization period (years)</th>
<th>5</th>
<th>10</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratepayers</td>
<td>49%</td>
<td>30%</td>
<td>6%</td>
</tr>
<tr>
<td>Stockholders</td>
<td>19</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>Taxpayers</td>
<td>32</td>
<td>42</td>
<td>56</td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Source: Taken from DOE/EIA (1983, pp. xvi). The allocation of abandonment costs among the three payer groups was estimated by the Energy Information Administration, the statistical and analytical agency within the US Department of Energy, for a hypothetical nuclear plant cancellation. The percentages reported above indicate the relative distribution of costs under the most common partial recovery method where all costs invested in a cancelled plant are amortized over 5, 10 and 20 year periods, but no return is earned on the unamortized balance. The hypothetical plant was assumed to be cancelled in mid-1983 and the present values of the incremental cash flows imposed on each payer group were calculated. The relative allocation of costs reported above assume a discount rate of 2 percentage points higher than the yield offered by US Treasury bonds that mature in the years in which the cash flows are received (DOE/EIA, 1983, pp. 54–56 and pp. 87–111).
investment in 13 of the 21 full recovery rulings, and 26 of the 70 partial recovery rulings reported in Table 1 (RRA, 1988, pp. 2–5).

Although variations in accounting methods, amortization periods and partial cost denials could alter the distributions of cash flows among investors, taxpayers and ratepayers, overall the regulatory treatment of abandonment costs was favorable to utility owners. Assuming a 50% tax rate, stockholders never bore more than half of the cost of prudent investments in abandoned nuclear projects even in the worst case of a no recovery ruling. Under the most common recovery method, the partial recovery method with an amortization period of 10 years, investors bore less than a third of the losses on cancelled nuclear plants.

In recognition of the fact that the partial recovery method disproportionately benefited stockholders, the FERC eventually changed its recovery policy in January of 1988 to a more equitable method (42 FERC ¶ 61,016 at p. 61,068). The new FERC policy allows utility owners full recovery of 50% of their investment in cancelled nuclear plants, and no recovery on the other 50% (42 FERC ¶ 61,016 at p. 61,068). In making the change the FERC reaffirmed its earlier policy objective of equitably balancing the interests of shareholders and ratepayers, but stated that in its implementation “through tax benefits, CWIP (Construction Work in Process), and accelerated capital recovery”, the original FERC partial recovery method had favored investors rather than producing an equal sharing of costs between stockholders and ratepayers (42 FERC ¶ 61,016 at p. 61,081).

Although the regulatory accounting treatment of nuclear plant abandonment costs was generally favorable to investors as opposed to other stakeholders, the above analysis suggests that stockholders would prefer completion to abandonment. If a planned nuclear project was completed, rates established once the plant was operative would provide investors with full recovery, i.e., both a return on and a return of invested capital. In the case of abandonment, our data shows that state regulatory commissions issued full recovery rulings in only 18.1% of the cases (Table 1). Moreover, benefits of full recovery rulings were frequently offset by imprudence findings that disallowed recovery of a portion of the investment (Teisberg, 1988, p. 9). Despite considerable variability in the amount of the losses allocated to stockholders by rate setting commissions, an analysis of the rate regulations and regulatory rulings on treatment of abandonment losses indicates investors could expect to bear some share of abandonment costs.

4. Stock market reaction to abandonment announcements

Since investors could expect to bear at least some portion of the costs of cancelled projects, they will prefer project completion to abandonment.
Consequently, we hypothesize that the market will react negatively to announcements of nuclear project abandonment decisions. Our paper employs a standard event-study methodology to test this hypothesis. We extend the work of Chen et al. (1987) by employing a larger sample size than Chen et al. (1987) to examine the stock market reaction to nuclear power plant cancellation announcements. Our sample was obtained by extending the time period of the study through 1987 and by including observations of the stock returns of partial owners in cases where a cancelled nuclear plant was jointly owned by more than one utility.

4.1. Sample selection

Over the history of the nuclear power industry from 1972 (the year of the first nuclear project cancellation) through 1990, construction plans have been cancelled for 117 nuclear reactors (NEI, 1996, pp. 1–6). In many cases a decision to abandon a nuclear project involved the cancellation of two or more reactors, and eight cancelled reactors were government owned. (NEI, 1996, pp. 1–6). Several of the cancelled plants were partially owned by two or more utilities (RRA, 1988, pp. 2–5).

Our sample consists of firms that announced nuclear plant abandonments in the period 1972–1987 for which (1) an announcement date can be identified through The Wall Street Journal, (2) daily return data for the investor-owned utilities are available on the Center for Research in Security Prices (CRSP) data base, and (3) no other significant events concerning the utility are evident from a search of The Wall Street Journal in the period surrounding the announcement date. The final sample includes 107 observations of firms who were full or partial owners of abandoned nuclear projects. 8

To assess the stock market reaction to nuclear project abandonment announcements, an event-study methodology was employed to consider abnormal performance over the event period relative to a model-generated normal return using 200 days of return observations for each utility security, beginning 250 days prior to the announcement date. The announcement date is defined as the day on which the announcement of the nuclear project abandonment appeared in The Wall Street Journal. Abnormal returns (ARs) were calculated as follows:

$$AR_u = R_u - (x_i + \beta_t R_{mt}),$$

8 A listing of the utilities, cancelled plants and abandonment dates included in the sample is available from the authors on request.
where $R_{it}$ is the actual return for firm $i$ on day $t$ and $(z_i + \beta_i R_{mt})$ is the predicted return from the market model. To control for information leakage or late arrival of information to the market, a cumulative abnormal return (CAR$_{in}$) is computed for each sample utility during each of four periods ($n$) around the announcement by summing estimated ARs over four announcements periods (capturing 2, 4, 13, and 26 days):

$$\text{CAR}_{in} = \sum \text{AR}_n.$$

Finally, cross-sectional average ARs for all utilities in the sample are also calculated for each day. The estimated average abnormal return for $N$ firms on day $t$, AR$_{Nt}$, is the simple average of the estimated AR$_{it}$, calculated by summing AR$_{it}$ across the $N$ firms and dividing this sum by $N$.

4.2. Results

Tables 3 and 4 present the cross-utility average residuals (abnormal returns) from the market model for each day in the 26-day announcement period: 10 days prior to the abandonment announcement to 15 days after the announcement, with the announcement date defined as 0. Consistent with our hypothesis, the results presented in Table 3 show that announcements of nuclear abandonment decisions are associated with significant negative ARs. Negative ARs are found both before the TMI Accident (1972–1978) and after TMI (1980–1987).

To compare the results with Chen et al. (1987), Table 4 shows the results of partitioning the post-TMI sample into two time periods: (1) the years immediately following TMI (1980–1981), and the subsequent period (1982–1987). The results are consistent with Chen et al. (1987, pp. 290–291) in that we find some evidence of a positive market reaction on day $t = 0$ in the period immediately following TMI (1980–1981). After 1981, however, the market reaction to abandonment announcements was strongly negative. As Chen et al. (1987, pp. 293–294) suggest the TMI nuclear accident may have initially

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9 The CRSP value-weighted market index return was used for $R_{mt}$. The parameters $z_i$ and $\beta_i$ are estimated by ordinary-least-squares regression using the 200 two-day return pairs ($R_{it}$, $R_{mt}$) over the interval from 250 to 51 trading days before the project abandonment announcement. AR$_{it}$ (the forecast error) provides an estimate of utility $i$'s abnormal stock return over the $t$th two-day interval. The market model was run with and without making the Scholes–Williams (Scholes and Williams, 1977, pp. 315–316) adjustment and the results were not significantly different. Use of a 100 day estimation period also yielded similar results. This is consistent with Brown and Warner (1985, pp. 16–19) who show that straightforward ordinary least-squares procedures for estimating the market model and standard parametric tests are as powerful as more elaborate tests in determining abnormal returns.
affected the market’s reaction to abandonment announcements by increasing investors’ awareness of the risks of nuclear power, including the risk that regulators would not allow utilities to recoup clean up costs by rate increases. However, the effect was short lived. Over the long term, investors reacted negatively to abandonment announcements in both the pre- and post-TMI periods (see Table 3).

The results of our expanded sample are not consistent with the Chen et al. (1987, p. 291) finding that the market viewed abandonments of nuclear projects favorably after 1979. Nor, are they consistent with McConnell and

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<td>n</td>
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<td>-2.39^{**}</td>
<td>-0.24193</td>
</tr>
<tr>
<td>2</td>
<td>-0.00418</td>
<td>-4.28^{***}</td>
<td>0.14523</td>
</tr>
<tr>
<td>3</td>
<td>-0.00093</td>
<td>-1.14</td>
<td>0.11319</td>
</tr>
<tr>
<td>4</td>
<td>0.00262</td>
<td>2.03^{**}</td>
<td>-0.04931</td>
</tr>
<tr>
<td>5</td>
<td>0.00027</td>
<td>0.48</td>
<td>0.28989</td>
</tr>
<tr>
<td>6</td>
<td>-0.00031</td>
<td>-0.68</td>
<td>0.10551</td>
</tr>
<tr>
<td>7</td>
<td>0.00030</td>
<td>0.97</td>
<td>0.07064</td>
</tr>
<tr>
<td>8</td>
<td>0.00114</td>
<td>1.27</td>
<td>0.00878</td>
</tr>
<tr>
<td>9</td>
<td>0.00244</td>
<td>1.47</td>
<td>0.30454</td>
</tr>
<tr>
<td>10</td>
<td>0.00122</td>
<td>0.85</td>
<td>0.40273</td>
</tr>
<tr>
<td>11</td>
<td>0.00216</td>
<td>0.97</td>
<td>0.08582</td>
</tr>
<tr>
<td>12</td>
<td>-0.00254</td>
<td>-2.24^{**}</td>
<td>0.06546</td>
</tr>
<tr>
<td>13</td>
<td>-0.00128</td>
<td>-1.77^{*}</td>
<td>-0.09018</td>
</tr>
<tr>
<td>14</td>
<td>-0.00113</td>
<td>-0.70</td>
<td>-0.27965</td>
</tr>
<tr>
<td>15</td>
<td>-0.00153</td>
<td>-1.20</td>
<td>0.26125</td>
</tr>
</tbody>
</table>

*AR_{Nt} is the simple average of the estimated individual (i) utility’s abnormal returns, AR_{it}, for N firms on day t.

*Significant at 0.10 in a two-tailed test.

**Significant at 0.05 in a two-tailed test.

***Significant at 0.01 in a two-tailed test.
Muscarella’s (1985, p. 399) finding that stockholders of public utilities and industrial firms react differently to decreases in planned capital expenditures. McConnell and Muscarella (1985, p. 416) found that decreases in planned capital expenditures by public utilities, unlike industrial firms, are not accompanied by significant negative excess returns. Our results however, are consistent with results of studies (Bowen et al., 1993, p. 106; Fuller et al., 1990, pp. 128–131) which examine utility stock price behavior over time and conclude that investors appear to believe that they will not be fully compensated for losses to utilities engaged in providing nuclear energy.

Table 4
Average abnormal returns ($AR_{Nt}$) around abandonment announcement date partitioned post-TMI sample

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$AR_{Nt}$</td>
<td>$t$-Statistic</td>
</tr>
<tr>
<td>-10</td>
<td>0.0028</td>
<td>0.22</td>
</tr>
<tr>
<td>-9</td>
<td>0.00157</td>
<td>0.36</td>
</tr>
<tr>
<td>-8</td>
<td>0.00105</td>
<td>0.49</td>
</tr>
<tr>
<td>-7</td>
<td>-0.00231</td>
<td>-0.83</td>
</tr>
<tr>
<td>-6</td>
<td>-0.00107</td>
<td>-0.70</td>
</tr>
<tr>
<td>-5</td>
<td>0.00068</td>
<td>-0.10</td>
</tr>
<tr>
<td>-4</td>
<td>0.00006</td>
<td>0.19</td>
</tr>
<tr>
<td>-3</td>
<td>-0.00159</td>
<td>-0.29</td>
</tr>
<tr>
<td>-2</td>
<td>-0.00030</td>
<td>0.52</td>
</tr>
<tr>
<td>-1</td>
<td>0.00135</td>
<td>0.36</td>
</tr>
<tr>
<td>0</td>
<td>0.00383</td>
<td>2.18***</td>
</tr>
<tr>
<td>1</td>
<td>0.00180</td>
<td>0.11</td>
</tr>
<tr>
<td>2</td>
<td>-0.00124</td>
<td>-0.92</td>
</tr>
<tr>
<td>3</td>
<td>0.00014</td>
<td>-0.55</td>
</tr>
<tr>
<td>4</td>
<td>-0.00006</td>
<td>-0.06</td>
</tr>
<tr>
<td>5</td>
<td>-0.00342</td>
<td>-1.43</td>
</tr>
<tr>
<td>6</td>
<td>-0.00028</td>
<td>-0.34</td>
</tr>
<tr>
<td>7</td>
<td>0.00032</td>
<td>0.88</td>
</tr>
<tr>
<td>8</td>
<td>0.00134</td>
<td>1.32</td>
</tr>
<tr>
<td>9</td>
<td>0.00233</td>
<td>0.87</td>
</tr>
<tr>
<td>10</td>
<td>-0.00062</td>
<td>-0.08</td>
</tr>
<tr>
<td>11</td>
<td>0.00263</td>
<td>1.28</td>
</tr>
<tr>
<td>12</td>
<td>-0.00551</td>
<td>-1.81*</td>
</tr>
<tr>
<td>13</td>
<td>0.00180</td>
<td>0.04</td>
</tr>
<tr>
<td>14</td>
<td>0.00160</td>
<td>-0.44</td>
</tr>
<tr>
<td>15</td>
<td>-0.00251</td>
<td>-0.97</td>
</tr>
</tbody>
</table>

$AR_{Nt}$ is the simple average of the estimated individual ($i$) utility’s abnormal returns, $AR_{it}$, for $N$ firms on day $t$.

* Significant at 0.10 in a two-tailed test.
** Significant at 0.05 in a two-tailed test.
*** Significant at 0.01 in a two-tailed test.

Muscarella’s (1985, p. 399) finding that stockholders of public utilities and industrial firms react differently to decreases in planned capital expenditures. McConnell and Muscarella (1985, p. 416) found that decreases in planned capital expenditures by public utilities, unlike industrial firms, are not accompanied by significant negative excess returns. Our results however, are consistent with results of studies (Bowen et al., 1993, p. 106; Fuller et al., 1990, pp. 128–131) which examine utility stock price behavior over time and conclude that investors appear to believe that they will not be fully compensated for losses to utilities engaged in providing nuclear energy.
5. Determinants of the market reaction

Additional tests using two-stage regression methods were performed to identify the determinants the abnormal negative returns found in our study. The objective of the tests is to determine whether stock market reactions to nuclear plant cancellation announcements are associated with either (1) the size of the investment, and/or (2) prior state-specific regulatory decisions.

5.1. Model 1: investment costs

The cost of building nuclear power plants escalated dramatically over time, increasing by 500–900% between 1970 and 1983 (Campbell, 1988, p. 4), as a result of design changes, construction delays, and stricter safety regulatory standards (Campbell, 1988, p. 7). The amounts invested in cancelled nuclear projects increased accordingly. Prior to 1980, most cancelled plants were in early stages of planning and construction with investments of less than $50 million (DOE/EIA, 1983, p. 36). After 1980, most abandonments involved investments in excess of $50 million (DOE/EIA, 1983, p. 36).

The first regression model tests for an association between market returns and the costs invested in cancelled nuclear projects. The dependent variable is the estimated utility-specific cumulative abnormal return (CAR). In measuring the CAR values, four alternative window lengths (n) surrounding the announcement date t = 0 are employed. The event windows are: (1) a two-day window (t−1 to t0); (2) a four-day window (t−1 to t2); (3) 13-day window (t−6 to t6); and (4) a 26-day window (t−10 to t15). The utility-specific independent variable (COST) is the amount invested in the abandoned plant scaled by firm total assets. The cost variable is normalized by total assets in order to capture the importance of the investment relative to firm size.

Model 1 is specified as:

\[ \text{CAR}_{in} = \alpha + \beta_1 \text{COST}_i, \]

where CAR_{in} is the cumulative abnormal return over an n-day period around the announcement of a nuclear project cancellation for utility i and COST_i is the investment/total assets for utility i.

The null hypothesis: \( \beta_1 = 0 \) is tested against the alternative hypothesis: \( \beta_1 < 0 \). Since investors’ risk of loss increases with the size of the investment, we expect the market reaction to nuclear project cancellations to be negatively associated with the costs.

To be included in the sample the following data must be available: (1) cumulative abnormal returns (CAR_i) for the four event windows; (2) The amount of investment in the cancelled projects obtained from Regulatory Research Associates, Moody’s, or The Wall Street Journal, and (3) Total
assets obtained from the Compusat data file. The selection yielded a sample of 75.\textsuperscript{10}

The results are presented in Table 5. The results show a significant negative association between the relative size of a utility’s investment in a nuclear project (\(COST_i\)) and stock market returns around the announcement of a decision to cancel the project. Costs are associated with negative returns in all four event windows.

5.2. Model 2: state-specific regulatory environment

Although national trends indicate that investors could expect to bear some portion of cancellation losses, rate setting is a decentralized process with considerable variability between rulings by public service commissions at the state level (DOE/EIA, 1983, pp. ix–xxii). Therefore, market reaction to abandonment announcements may be affected by the state-specific regulatory environment in which utilities operate, as well as overall national trends. Based on our analysis of the cash flow consequences of regulatory accounting policies noted earlier in our paper, we can derive the following expectations regarding investor behavior. Investors anticipating a full recovery ruling from a state regulatory commission would not be expected to react negatively to abandonment announcements since the cash flow consequences of abandonment and non-abandonment are identical. Investors anticipating a state-specific ruling of no recovery or partial recovery, however, would be expected to react negatively to abandonment announcements since both these rulings have negative cash flow consequences in comparison to the alternative of bringing the project to completion. We use prior regulatory rulings on abandonment costs as a proxy variable for the state-specific regulatory environment in order to examine the association between the state regulatory environment and the stock market’s reaction to abandonment decisions.

A sub-sample comprised of the 33 cases where state commissions had issued prior regulatory decisions on the treatment of nuclear plant abandonment costs is used to examine the association between the content of prior state-specific regulatory accounting rulings and the market’s reaction to cancellation announcements. Model 2 controls for the size of the utility’s investment and

\textsuperscript{10} Sample statistics are:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>Max</th>
<th>Med.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment (in millions)</td>
<td>125.8</td>
<td>204.9</td>
<td>1298</td>
<td>62</td>
<td>0.98</td>
</tr>
<tr>
<td>Total assets (in millions)</td>
<td>2933.0</td>
<td>2145.2</td>
<td>8723.2</td>
<td>2451.6</td>
<td>65.1</td>
</tr>
<tr>
<td>COST (Investment/total assets)</td>
<td>0.0431</td>
<td>0.0462</td>
<td>0.2666</td>
<td>0.0266</td>
<td>0.0002</td>
</tr>
</tbody>
</table>
Table 5
Ordinary least squares regression results for the influence of costs invested in cancelled nuclear projects on cumulative abnormal returns, CARₙᵢ, for 2-day, 4-day, 13-day, and 26-day event periods (n = 75)

<table>
<thead>
<tr>
<th>Independent variables (predicted sign)</th>
<th>2-day period (−1 to 0)</th>
<th>4-day period (−1 to +2)</th>
<th>13-day period (−6 to +6)</th>
<th>26-day period (−10 to +15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated coefficient</td>
<td>t-Statistic</td>
<td>Estimated coefficient</td>
<td>t-Statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0040</td>
<td>0.831</td>
<td>0.0076</td>
<td>0.885</td>
</tr>
<tr>
<td>Cost (−)</td>
<td>−0.2797</td>
<td>−3.696***</td>
<td>−0.5548</td>
<td>−4.058***</td>
</tr>
</tbody>
</table>

* Model estimates
- Adjusted $R^2$: 0.1461, 0.1729, 0.2693, 0.1442
- $F$-statistic: 13.661, 16.467, 28.273, 13.471
- Probability of $F$-statistic: 0.0004, 0.0001, 0.0001, 0.0005

---

*a Model 1: CARₙᵢ = \(\alpha + \beta_1\text{COST}_i\), where CARₙᵢ is the utility specific cumulative abnormal return measured by summing the individual utility’s estimated abnormal returns over four event periods (\(\text{CAR}_i = \sum \text{AR}_i\)) and COST_i is the total investment in the nuclear project divided by the total assets of the utility.

* Significant at 0.10 in a one-tailed test.

*** Significant at 0.01 in a one-tailed test.
examines the relationship between estimated CARs around the announcement of a plant cancellation and the accounting method (i.e., full recovery, partial recovery, or no recovery) adopted in the most recent ruling by a public utility commission with jurisdiction over the cancelling utility. The sample size is limited by the number of observations for which prior regulatory accounting rulings existed at the time of the abandonment announcement. Of the 33 firms in the sub-sample, state regulatory commissions issued full recovery rulings in three cases (9.1% of the sample), partial recovery rulings in 20 cases (60.6% of the sample), and no recovery rulings in 10 cases (30.3% of the sample). By comparison, Table 1 shows that state regulators issued full recovery rulings in 18.1% of cases, partial recovery rulings in 60.3% of cases, and no recovery rulings in 21.6% of cases.

The dependent variable is the estimated utility specific CARs (CAR\textsubscript{in}) calculated over four event windows surrounding the announcement of a nuclear project cancellation. The independent variables are (1) the amount of investment in cancelled projects scaled by total assets, and (2) dummy variables indicating the recovery method adopted in the most recent rulings by a state commission with jurisdiction over the cancelling utility.\footnote{For utilities operating in multiple state jurisdictions, observations were included if at least one state had issued a prior ruling. If a utility operated in more than one state and these states had issued conflicting prior rulings, the observation was omitted.}

Model 2 is specified as:

\[
\text{CAR}^{\text{in}} = \alpha + \beta_1 \text{COST}_i + \beta_2 \text{Partial Recovery}_i + \beta_3 \text{No Recovery}_i,
\]

where \(\text{CAR}^{\text{in}}\) is the cumulative abnormal returns over a \(n\)-day period around the announcement of a nuclear project cancellation for utility \(i\). \(\text{COST}_i\) is investment/total assets for utility \(i\). Partial Recovery\(_i\) is 1 if the prior state ruling allowed amortization of the investment, but no return on the unamortized balance, and 0 otherwise. No Recovery\(_i\) is 1 if the prior state ruling disallowed all recovery, and 0 otherwise.

As specified, the effect of a prior full recovery ruling is captured in the intercept term, and the parameters on the dummy variables indicate the marginal effect of the prior decision to adopt the partial recovery method or disallow all recovery. Since our analysis of cash flow consequences shows that full recovery generates the same cash flow as non-abandonment, while both partial recovery and the no recovery have negative cash flow consequences, we hypothesize that the coefficients \(\beta_2\) and \(\beta_3\) will be significantly negative. Formally, we test the null hypothesis: \(\beta_2\) and \(\beta_3 = 0\); against the alternative hypothesis: \(\beta_2\) and \(\beta_3 < 0\).

The results of the ordinary least squares regression analysis are presented in Table 6. Consistent with previous results, the findings indicate that the relative
Table 6
Ordinary least squares regression results for the influence of costs invested in canceled nuclear projects and state-specific regulatory environment on cumulative abnormal returns, CAR
in
, For 2-day, 4-day, 13-day and 26-day event periods (n = 33)

<table>
<thead>
<tr>
<th>Independent variables (predicted sign)</th>
<th>2-day period (−1 to 0)</th>
<th>4-day period (−1 to +2)</th>
<th>13-day period (−6 to +6)</th>
<th>26-day period (−10 to +15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated coefficient</td>
<td>t-Statistic</td>
<td>Estimated coefficient</td>
<td>t-Statistic</td>
</tr>
<tr>
<td>Intercept (0)</td>
<td>0.0303</td>
<td>1.581*</td>
<td>0.0321</td>
<td>0.780</td>
</tr>
<tr>
<td>Cost (−)</td>
<td>−0.4088</td>
<td>−3.560**</td>
<td>−0.6282</td>
<td>−2.550***</td>
</tr>
<tr>
<td>Partial Recovery (−)</td>
<td>−0.0361</td>
<td>−1.728**</td>
<td>−0.4330</td>
<td>−0.967</td>
</tr>
<tr>
<td>No Recovery (−)</td>
<td>−0.0127</td>
<td>−0.537</td>
<td>−0.0398</td>
<td>−0.786</td>
</tr>
</tbody>
</table>

Model estimates

<table>
<thead>
<tr>
<th></th>
<th>Adjusted R²</th>
<th>F-statistic</th>
<th>Probability of F-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3259</td>
<td>6.156</td>
<td>0.0023</td>
</tr>
<tr>
<td></td>
<td>0.1826</td>
<td>3.382</td>
<td>0.0314</td>
</tr>
<tr>
<td></td>
<td>0.3447</td>
<td>6.61</td>
<td>0.0015</td>
</tr>
<tr>
<td></td>
<td>0.1110</td>
<td>2.332</td>
<td>0.0949</td>
</tr>
</tbody>
</table>

* Model 2: CAR
in
 = β₀ + β₁COST + β₂ Partial Recovery + β₃ No Recovery, where CAR
in
 is the utility specific cumulative abnormal return measured by summing the individual utility’s estimated abnormal returns over four event periods (CAR
in
 = ∑ AR
it
). COST
i
 is the total investment in the nuclear project divided by the total assets of the utility. Partial Recovery
i
 is the policy allowing utilities a return of, but no return on their investment. No Recovery
i
 is defined as no return of or on the costs of abandoned projects. The intercept in this model represents Full Recovery where utility owners recover the full cost of prudent investments and earn a return the unamortized balance of their investment.

* Significant at 0.10 in a one-tailed test.
** Significant at 0.05 in a one-tailed test.
*** Significant at 0.01 in a one-tailed test.
investment size is a significant predictor of negative excess return. Our tests did not confirm the hypothesis that the existence of a prior state-specific regulation mandating no recovery of costs invested in cancelled nuclear plants or the partial recovery method would negatively affect the stock market’s reaction to announcements of subsequent plant cancellations.\(^{12}\)

Due to sample size limitations, further nonparametric tests were conducted (Siegel, 1956). Tables 7 and 8 summarized the results of the nonparametric analysis. These tables contain 38 observations, including five observations that were excluded from the parametric analysis due to the unavailability of cost data. Table 7 shows the frequency distributions

\^{a} All variables are defined in Table 6.

\(^{12}\) A Chow test (Kennedy, 1987, pp. 229–230) for differences in regression coefficients for different groups similarly detected no differences between CARs for the three types of regulatory decisions (Full Recovery, Partial Recovery, No Recovery) after controlling for the amount of investment.
obtained by cross tabulating the sign of the CARs (positive or negative) against prior regulatory decisions (Full Recovery, Partial Recovery, No Recovery) for our four event periods. Table 8 shows the results of a nonparametric tests that consider the magnitude as well as the sign of the CARs. Kruskal–Wallis tests for differences between the three groups of prior regulatory decisions yield significant chi squares for the four-day and two-day event periods. Pairwise comparisons using Mann–Whitney procedures find significant differences between Full Recovery and Partial Recovery rulings, and between Full Recovery and No Recovery rulings for the 13-day, four-day and two-day event windows. No significant differences are detected between Partial Recovery and No Recovery rulings. While the nonparametric results lend support to the hypothesis that state-specific prior regulatory rulings influence the market’s reaction to cancellation announcements, the tests are inconclusive since they do not control for the relative size of investment in cancelled nuclear projects.

5.3. Discussion

Several factors could explain the failure to find the expected association between the state-specific regulatory environment and the market reaction
to abandonment announcements in the parametric tests. First, the power of the tests is limited by the small sample size. Second, state-specific prior regulatory rulings may be an inadequate proxy for state regulatory environment. Further research might develop a more accurate measure of state regulatory environment by creating an index that factors in regulatory commissions rulings on a number of issues, rather than considering only prior rulings on abandonment costs. Third, the market may have impounded the effect of expected regulatory rulings at a time other than the announcement date.

Alternatively, it is possible that the market discounted prior state-specific regulatory decisions, because of uncertainty as to whether further regulatory rulings would be consistent with prior rulings. The decentralized, volatile, and litigious regulatory environment undoubtedly increased uncertainty as to what portion of the losses investors would ultimately bear. It was not uncommon for state regulatory commissions to reverse previous rulings on nuclear plant abandonment costs (RRA, 1988, pp. 2–5). Nor, was it unusual for utilities to operate under more than one state jurisdiction, and thus be subject to sometimes contradictory regulatory rulings in different states (RRA, 1988, pp. 2–5). On the legal front, utilities and/or consumer groups frequently appealed unfavorable commission decisions through the courts, particularly in cases of no recovery or full recovery rulings (RRA, 1988, pp. 2–22). In some cases, appellate courts overtuned commission’s rulings (RRA, 1988, pp. 2–22). The legal environment remained highly uncertain until 1989 when the US Supreme Court upheld the authority of states to disallow recovery of capital invested in abandoned nuclear plants (Duquesne Light Co. v. Barasch, 1989).

In sum, rulings on nuclear power abandonment costs varied over time even within a given state as a result of litigation, changing state laws, and/or the intrusion of nuclear politics on the rate setting process. Such uncertainty combined with the political volatility of nuclear power may have caused investors to discount information about state-specific prior rulings in pricing utilities securities. The results of our study, however, indicate that investors did consider information about broader national regulatory trends, i.e., the high probability that investors would bear some portion of abandonment losses, in pricing securities.

6. Conclusions

Barring a revival of the US nuclear power industry, future losses on nuclear project abandonments will not be consequential. Nonetheless, regulatory accounting for the nuclear industry will continue to have significant cash flow consequences, most immediately in the area of accounting for the cost of
stranded assets (Blacconiere et al., 1997, p. 199). Recent trends toward deregulation of the electric utilities industry are opening the way for consumer choice and rate competition (Parker and Grove, 1998, p. 67). As competition is phased in, state regulators and legislatures will decide the extent to which previously regulated utilities will be allowed to recover the cost of so-called stranded costs through levies on consumers. Stranded costs are the portion of a utilities’ existing assets that would have been recovered under regulation, but cannot be recovered through rates set in a competitive market (Parker and Grove, 1998, pp. 67–69). They include high-cost (non-competitive) generating plants such as nuclear facilities, and the cost of decommissioning nuclear plants at the end of their lives. Nationally, stranded costs are estimated the range between $100 and $200 billion (Parker and Grove, 1998, pp. 67–69). The issue of how state regulators employ accounting choices and estimates to allocate the cost of stranded investments in nuclear technologies among stockholders, ratepayers, and taxpayers remains politically salient in the era of deregulation.

Our review of public utility commissions’ decisions on nuclear plant abandonment costs shows that, in the past, regulatory accounting treatment was generally favorable to investors. As the classification of regulatory decisions in Table 1 shows, full recovery rulings were issued in approximately 18.1% of the rate cases; no recovery rulings were issued in approximately 21.6% of the cases; and, partial recovery rulings in approximately 60.3% of the cases. Under full recovery investors both recouped their costs and earned a return on their investment in failed nuclear projects. Because of tax savings, stockholders never bore the full cost of investments in abandoned nuclear projects even in the worst case of a no recovery ruling (DOE/EIA, 1983, p. 36). Under the most common recovery method, the partial method with an amortization period of 10 years, investors bore an estimated 19–38% of the losses on cancelled nuclear plants (DOE/EIA, 1983, pp. 39–40).

While a substantial share of the abandonment losses were transferred to ratepayers and taxpayers, investors bore some portion of the losses in most cases. Indeed, our review of the regulatory accounting decisions concludes that regulatory incentives would lead investors to prefer project completion over abandonment. If a nuclear plant could be brought to completion, investors would earn both a return on and a return of their investment whereas, in the case of abandonment, investors received similar returns only in 18.1% of cases where regulators ruled in favor of full recovery. Thus, our review of rate regulations led to the hypothesis that the stock market would react negatively to nuclear project cancellation announcements.

Consistent with this expectation, our empirical results indicate that overall the stock market reacted negatively to announcements of nuclear power project cancellations by regulated public utilities. The finding is significant in two
respects. First, our results confirm prior research studies (Bowen et al., 1983, p. 106; Fuller et al., 1990, pp. 128–131) that suggest investors in nuclear utilities do not expect to be fully compensated for losses through regulatory rate increases. Our finding is not consistent with theoretical speculations that utility stockholders will either react positively or be neutral with respect to capital project abandonment decisions because of expectations for favorable rate rulings (Chen et al., 1987, pp. 293, 294; McConnell and Mascarella, 1985, p. 416). To the contrary, our study finds that notwithstanding favorable regulatory treatment, investors bore some risk from investment in nuclear technology given the institutionally decentralized US regulatory environment and the political volatility of nuclear power.

Second, the finding of a negative reaction to nuclear abandonment announcements has implications for theory development. Recent trends in the theoretical literature (for example, see Cheng, 1994; Mueller, 1989; March and Olsen, 1989; Powell and DiMaggio, 1991) on state interventions in the economy suggest models of regulation that view regulators simply as pro-producer or pro-consumer provide inadequate grounds on which to theorize the consequences of regulatory accounting policies. To the contrary, the literature indicates that public sector accounting choices are the outcome of complex political processes the outcome of which is not easily predicted. These processes involve interactions between elected officials, agency administrators and staff, media, credit markets, taxpayers, and interest groups within an environment constrained by socioeconomic conditions, technical capacity, and political and bureaucratic structures.

In the absence of a simple predictive theory, hypotheses concerning the economic consequences of regulatory accounting policy choices cannot be formulated in the absence of concrete and detailed analyses of regulatory rulings. In the case of our study, such an historical analysis of the regulatory treatment of abandonment losses formed the basis for the empirically grounded hypothesis that the market would react negatively to abandonment decisions; a hypothesis that was confirmed by empirical tests. We hope that our article will encourage others to ground theoretical propositions about the effects of state interventions in the economy within the context of concrete analyses of incentives created by regulatory accounting and taxing regimes that govern wealth transfers and resource allocations within industries.

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References


