The Price is Right: Restructuring Gain from Market Valuation of Utility Generating Assets

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Introduction

The restructuring of the US electric industry is generally assumed to confront most utilities with huge stranded investments. Several studies have found that New England utilities, with large nuclear investments and old oil plants, will have particularly large stranded investments (e.g., RDI [1995], Moody's [1995], Baxter [1995]). Many utilities have reinforced this impression by claiming massive stranded investments, and asking that their ratepayers pay billions of dollars to make the utilities whole for those losses. (e.g., MECo [1996], BECo [1996]).

These estimates of stranded investments appear to suffer from a variety of problems, including:

- Failure to reflect any market value for existing plant (a problem most frequently found in utility estimates).
- Valuing only the energy output of utility plants, without any recognition of capacity value.
- Estimating energy value from prices of baseload purchases, and ignoring the higher value of peaking and energy supplies.
- Ignoring the load-shifting and ancillary-service value of pumped-storage facilities.
- Assuming that recent depressed market conditions will continue, resulting in low market values of power and low energy output from utility plants.
- Comparing the depressed market value for the near future (only five or ten years) to the front-loaded revenue-requirements in the same period, or to the entire cost of the remaining investment.
- Assuming that current ratemaking costs per kWh generated will continue, despite erosion of ratebase by depreciation and the increase in sales with load growth.
- Failing to recognize any improvement in plant performance in a competitive environment, or increased value of the plants under new ownership or management.

- Assuming continued operation of all utility generation, including uneconomical units which lose money by operating.

This study derives a more detailed and realistic estimate of stranded investment in generation assets for five Massachusetts investor-owned electric utilities, avoiding the problems enumerated above. We find that, under most likely circumstances, market valuation of most generation assets will exceed their net investment, resulting in an overall restructuring gain of approximately $4 billion for these five IOUs.[1] As has been confirmed by other independent analyses (e.g. Yoshimura [1996]), similar results are likely to obtain in much of the Northeast.

The level of stranded investment or restructuring gain depends on the relative magnitude of the utility's remaining investment in its plants, compared to the market value of those plants. The market value of each existing generating unit is determined by potential buyers' expectations of market prices and of the unit's performance under the buyer's control. Power plant performance parameters that influence plant value include the reliability of each unit, non-fuel operating costs, fuel costs (which are influenced by heat rate and fuel flexibility), and required capital backfits to maintain other performance measures and meet safety and environmental requirements. Market prices for power are determined by the short-term supply and demand situation, the performance of existing generation, the costs of new peaking and baseload capacity, and future fuel prices.

Estimating Restructuring Gains

Scope

Our analysis estimates the stranded generation investment for five Massachusetts investor-owned utilities: Boston Edison (BECo), Cambridge Electric, Commonwealth Electric (ComElectric), the Massachusetts portion of New England Electric System (NEES), and Western Massachusetts Electric Company (WMECo). These utilities own different mixes of two new expensive nuclear units (Millstone 3 and Seabrook), six old nuclear units (Connecticut Yankee, Millstone 1 and 2, Maine Yankee, Pilgrim, and Vermont Yankee), and a variety of oil- and gas-fired steam, coal, hydro-electric, and combustion-turbine plants.

Stranded investment was based on each utility's ownership of plants, with adjustments for joint ownership, unit sales, and anticipated retirements. We did not include the significant value of land and auxiliary equipment at the sites of retired plants and undeveloped properties.

We considered only utility-owned generation, excluding all gains or losses from revaluation of purchases at market prices, as well as potentially stranded generation-related regulatory assets, and nuclear decommissioning. We assumed that safety considerations will require that primary responsibility for the adequacy of nuclear decommissioning funds will continue to rest on ratepayers (or some other broad-based and secure source) rather than on the generation owners in a competitive market. Cost-control considerations would probably require that some decommissioning costs be borne by the plant operator.

Methodology

Stranded investment was estimated as the difference between net plant and the present value of future operating profits, as of January 1, 1998. Net plant was estimated as

1994 gross plant + 1995-97 capital additions – 1994 accumulated depreciation – 1995-97 depreciation

We did not net out the value of deferred income taxes, which utilities have collected from ratepayers but not paid to the government. This constitutes a significant reduction in net utility investment; depending on the form of the market transition, the deferred tax bill may become due with divestiture.

Operating profits were calculated as the present value of the market value of energy and capacity, less annual expenditures for fuel, O&M, and (for nuclear units) capital additions.[2]

Where operating profits were negative, we assumed that the plant would be shut down, and set stranded investment to net plant.

Inputs and Assumptions

Base-Case Plant Performance

Most plant performance inputs were estimated at recent levels for each unit, or groups of similar units. The nuclear plants are more important in determining stranded costs, so we modeled them in greater detail than other units. Except for Millstone 1 and 2 (whose data are often reported together), each New England nuclear unit was modeled separately, based on its recent capacity factor (65% to 85% for various units), non-fuel O&M, and capital additions. Each nuclear unit was assumed to operate until the end of its license.

We aggregated each utility's non-nuclear generation into groups by fuel type. For each group, O&M was based on historical costs for company-owned or comparable plants.[3] Fossil fuel prices were derived from a mid-range 1995 forecast, including escalation of natural gas and oil at a little less than 2% real. Fossil units are assumed to operate through 2015, while hydro units are assumed to operate through 2035.

Energy costs and benefits were treated differently for various groups of plants. Peaking capacity was treated as having no energy costs or benefits. Most oil and gas steam plants were assumed to operate at a 50% capacity factor and 10,000 BTU/kWh heat rate; a few outliers are assigned higher capacity factor and lower heat rate, or vice versa. Coal capacity was modeled at an 80% capacity factor.

We aggregated the conventional hydro resources of each utility, and assumed continued generation at historical capacity factors. We also assigned storage hydro a small credit for rapid-start capability. Since pumped-storage hydro shift energy supplies, rather than generating additional electricity, we estimated the energy benefits of pumped storage by computing the value of shifting energy from New England's low-cost hours to its high-cost hours, reflecting typical 30% cycle losses.

Base-Case Market Prices

We developed forecasts of market prices of capacity and energy. Both components are driven by the projection in the New England Power Pool's 1995 *Capacity, Energy, Load and Transmission Report* that New England will experience a capacity deficiency by 2003. Based on this 2003 need date, we assumed that the market value of capacity will trend upwards from the historical $11/kW-yr in 1996 to $52/kW-year in 2003, the full cost of a new peaker (in real-levelized 1996 dollars).

We based our projection of the market value of energy on a starting value of $25/MWh in 1995, gradually rising to $43/MWh, the cost of energy from a new intermediate gas combined-cycle plant, in 2003.

Marginal system operating costs vary throughout the year. In high-load periods, more-expensive plants are forced to run; in a competitive market, this will raise the spot price for all suppliers. Among fully dispatchable plants, those with low fuel costs will run more, but will receive a lower average annual price than those with high running costs, which are only operated in the high-cost hours. We adjusted market prices for each type of capacity to reflect these differentials.

We used a discount rate of 10%, typical of utility embedded and marginal costs of capital and the discount rates used in utility analyses.

Sensitivities

The size of the restructuring gain will vary with:

- the performance and costs of the plants in a competitive environment, compared to historical levels,
- the market values of capacity and energy, and
- the cost of financing the acquisition of existing plants.

We reflected the first variable by improving nuclear performance to levels that may be achievable, if changes in management or management incentives allow under-performing New England nuclear units to perform more like the industry leaders. This scenario modeled nuclear-plant costs and performance from past utility projections and the performance of comparable well-operated plants, approximating the results an enthusiastic purchaser might expect from the plants under new ownership in a competitive environment. The change in assumptions was large for the plants with the worst historical performance and small for the best performers. For example, we brought the low end of the capacity factors up to 74%, but did not change the high end of the range.

Second, we varied market prices of energy and capacity over a wide range, from 50% to 150% of our initial estimate. We kept constant the relationships between energy and capacity prices, and between prices for energy of different load shapes. For each market price, we computed the restructuring gain (or stranded cost) for each market, and identified units that became uneconomic to run.

Finally, we increased the discount rate to 15% to reflect the possibility that non-utility owners of generation in a competitive environment would have higher financing costs than the utilities.

Results

Our results were surprising in their direction and robustness, as indicated in the following table and figure.

- As shown in the table, market valuation of the five Massachusetts IOUs' generating assets results in a net restructuring gain of approximately $4 billion under base-case assumptions. The $880 million of nuclear stranded investment is offset by more than $4.9 billion of restructuring gain for non-nuclear plant.
- Over most of the sensitivity range, each utility's generation assets as a whole are worth more than the net investment, producing large restructuring gains.
- The combustion turbines and hydro resources always produced restructuring gains.
- Each utility's portfolio of fossil-steam capacity—coal, oil, gas, and multi-fueled—produces a restructuring gain, as do most of the individual power plants under most circumstances.
- For the older nuclear and fossil-steam capacity, with relatively small remaining investment, each unit generally either produce a restructuring gain (net profits exceed remaining invest-

Summary of Stranded Investment for Five Massachusetts Utilities

	Operating Profit	Gross Plant	Accumulated Depreciation	Stranded Investment
Nuclear Production Plant				
Connecticut Yankee	16,533,775	127,143,771	111,534,178	(924,183)
Maine Yankee	180,288,690	100,275,150	54,111,115	(134,124,655)
Millstone 1&2	(65,467,984)	272,977,836	155,340,632	117,637,204
Millstone 3	266,811,019	756,500,093	213,068,205	276,620,868
Pilgrim	(373,288,625)	1,098,473,967	487,183,943	611,290,025
Seabrook	154,207,360	274,700,631	53,231,385	67,261,886
Vermont Yankee	84,065,208	76,893,897	47,204,501	(54,375,813)
Total Nuclear	**701,906,052**	**2,706,965,344**	**1,121,673,960**	**883,385,332**
Non-Nuclear Production Plant				
Steam Plant				
Oil or Gas Steam	2,801,145,825	221,754,222	178,059,700	(963,410,818)
Coal Steam	978,667,792	-	-	-
Total Steam	3,779,813,618	1,808,324,348	1,016,636,109	(2,988,125,378)
CTs	169,471,447	57,315,698	34,478,496	(146,634,246)
Hydraulic Plant				
Conventional Hydro	1,267,384,409	50,684,372	23,132,261	(202,820,183)
Pumped Storage Hydro	703,777,555	25,195,130	13,053,813	(234,088,195)
Total Hydro	1,971,161,964	317,549,905	112,343,358	(1,765,955,418)
Total Non-Nuclear	**5,920,447,029**	**2,183,189,951**	**1,163,457,964**	**(4,900,715,042)**
TOTAL Production Plant	**6,622,353,081**	**4,890,155,295**	**2,285,131,924**	**(4,017,329,710)**

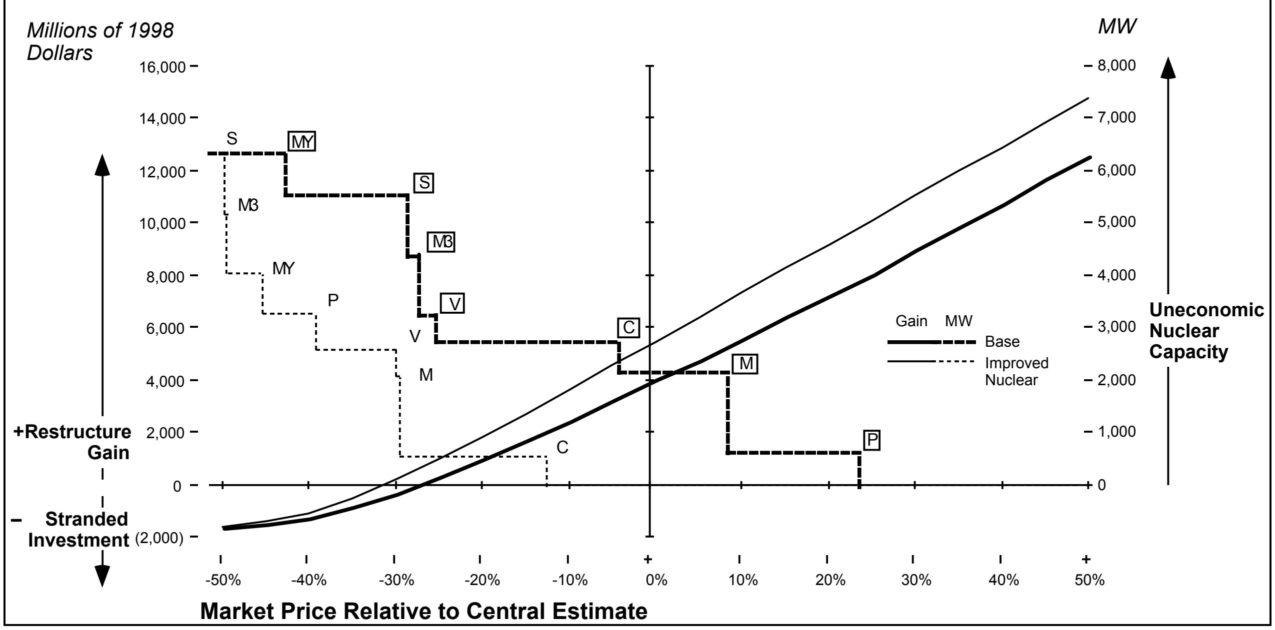
Note: Stranded costs equal gross plant, less accumulated depreciation, less operating profit where applicable. Operating losses are not subtracted, because uneconomic plants are assumed to be retired.

ment) or are uneconomical to operate (net profits are negative). If these units are economic to operate, they need not produce a very large operating profit to create a restructuring gain. Utilities that can legitimately claim significant stranded investment from this capacity, due to high operating costs or low market prices, will generally face retirement of most of that capacity.

- In contrast, the high-cost nuclear units that entered service in the 1980s and 1990s are cost-effective to operate under most combinations of assumptions, but are unlikely to be worth as much as their remaining investment. A portion (but not all) of this investment will be stranded.[4]
- Market prices low enough to strand significant investment will likely result in the retirement of significant amounts of nuclear and fossil-steam capacity, erasing any temporary capacity surplus. The figure shows the price at which each of the nuclear units becomes uneconomic. These low market prices can thus be supported only by large amounts of new low-cost power resources.

Higher discount rates (not shown in the figure) reduce restructuring gains but do not change the qualitative results. In our base case, the 15% discount rate reduces the gains by a third for three of the utilities, and essentially zeroes out the gains of the other two. With better nuclear performance, all five utilities experience restructuring gains.

Restructuring Gain and Uneconomic Nuclear Capacity as a Function of Market Price



For each scenario, each price is associated with a gain (or loss) and with the profitability (or unprofitablity) of each nuclear plant. in New England. For Connecticut Yankee (C), Millstone 1&2 (M) and 3 (M3), Maine Yankee (MY), Pilgrim (P), Seabrook (S) and Vermont Yankee (V), points show the price below which each unit would be unprofitable. Gain (or loss) shows is for all five utilities from all plants. In the base case, for example, the price of power would have to drop 30% below the most likely estimate for the utilities, as a group, to see a net stranded loss; at that price, most of the region's power plants would be too costly to operate profitably. Note: the model assumes that as price changes, all other factors, such as fuel costs, remain the same.

Regulatory Implications

Our results suggest a number of important implications for regulatory and legislative policy in the process of electric utility restructuring. These include:

- For most utilities, regulators should not assume that any investment will be stranded. Gains are more likely than losses. Those investment gains may be offset by losses on purchased-power contracts and by the recovery of regulatory assets (e.g., accounting transitions, deferred recovery of generation costs).
- Except for the youngest and most expensive (mostly nuclear) units, stranded investments are unlikely for units that are economic to operate. The restructuring process is thus likely to result in some retirements of units that should have been retired, regardless of whether the industry is restructured. Cost recovery for these plants may be different than for investments stranded by the restructuring itself.[5]
- The value of utility plants is sensitive to projections of their performance. Those projections will vary with the skill and optimism of prospective owners. The value to ratepayers can thus be maximized by improving performance and selling each plant to the highest bidder.[6]
- The value of those plants will also depend on market prices for power. If generation is not valued by the market in a divestiture, the regulator must carefully determine market prices, as well as the reliability, dispatch, and operating costs of the unit in a competitive environment.[7]

Notes

[1]Additional details of the analysis are described in "Estimation of Market Value, Stranded Investment, and Restructuring Gains for Major Massachusetts Utilities" prepared for the Massachusetts Attorney General. This report is available on request from Resource Insight, Inc., 18 Tremont Street, Boston, MA 02108, (617) 723-1774.

[2]Capital additions are generally small and sporadic for other generation, and would generally be covered by even small competition-driven improvements in operating costs.

[3]We added 20% to all non-fuel O&M for general and administrative expenses.

[4]The utilities that have already written off portions of their investments in these units may be able to recover the remainder from the market.

[5]Regulators have generally split the costs of prudently-abandoned plants between ratepayers and shareholders.

[6]In many regions, divestiture will be also very helpful (perhaps essential) in creating a working competitive market.

[7]The competitive environment may benefit plant operators, strengthening their positions in seeking reductions in costs from suppliers.

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