# EVALUATING POWER PLANT PROPERTY TAX BURDENS IN A CHANGING INDUSTRY



Electric industry restructuring, technological advances, and changing environmental laws and regulations are providing the opportunity -- and in some cases, the necessity -- for diligent companies to lower a substantial cost of doing business. This cost is the property tax, which in the majority of the states is based upon the fair market value of the property. Fair market value, in general, is what a hypothetical reasonable buyer and a reasonable seller would agree the property is worth, with both parties having knowledge of the relevant facts and neither party being compelled to buy or sell. Traditionally, rate base, with some adjustments, has been the starting point from which to analyze whether utility property was being valued at fair market value. But the relevance of this starting point (or benchmark) is decreasing for electric generation plants.

### *Rate Base As A Valuation Benchmark*

Before the specific electric industry changes are discussed, some discussion of how fair market value is determined is warranted. There are three separate indicators or techniques for finding the fair market value of property. The first is the income approach to value. The premise of the income approach is that property is worth the present value of the income stream the property can be expected to earn. For regulated utilities, future income is projected based upon the utility's rate of return on its rate base and then present valued by the market cost of capital. If the market cost of capital approximates the utility's permitted (and assumed achieved) rate of return, the income indicator would be approximately equal to rate base.

Next is the cost approach to value. The cost approach is based on the principle of substitution: no prudent buyer would pay more for a property than what it would cost to build a substitute with equal operating characteristics. Any investor would prefer a brand new plant to an old one. From the cost of the new replacement plant, the appraiser would need to deduct, as forms of obsolescence, the value of the appraised plant's physical deterioration, the present value of its excess operating costs, and the value of any earnings limitations, such as those caused by regulations, that the appraised older plant would have but the new replacement plant would not. The cost approach generally sets an upper limit on value. Historically, net book cost or rate base approximated the correct cost indicator for utility property because it incorporates the physical deterioration and elements of functional obsolescence recognized by the relevant regulatory body's allowed yearly depreciation rates as well as the external obsolescence caused by the regulatory body limiting the property's earning ability to a return on its net book cost.

Last is the sales comparison approach to value. This approach considers actual market sales prices of comparable properties -- it is most often used for residential real estate. Under the sales comparison approach to value in a fully regulated environment, those few power plant sales that would occur would likely be to another utility, and absent any strategic purposes peculiar to a particular buyer, the buyer would have no reason to pay more than rate base. Usually because of a lack of any meaningful sales of generating plants, some tax assessors have used as a surrogate, the sales of the stock and debt instruments of the corporations owning the generating plants.

### *Deregulation Breaks The Tie Between Rate Base and Value*

Three major changes are now occurring that are disrupting this connection between rate base and value. The first major force leading to a revaluation of generating assets is, of course, deregulation and increasing competition. With deregulation, rate base, and a permitted rate of return will no longer be a relevant way to predict the income property will earn. Rather, without regulation, a competitive market for electricity will develop, just as it developed in the natural gas industry. The market price of electricity will be determined in the short run by the marginal operating costs of plants existing in the market, and in the long run, by the total costs of the plants with the most efficient technology. The box below shows how the revenue and income would differ between a regulated market and a competitive market for a hypothetical nuclear plant and a hypothetical coal-fired plant. First, the reader will note that under regulation, the nuclear facility returns a higher income to the investor than the coal-fired facility because of its higher rate base. It also provides higher total revenue to the investor as its often higher operating costs and higher yearly depreciation charges are collected in rates. In a competitive market, total revenue becomes market price times the total output of the plant, so that the revenue earned by the two plants will be equal. But their costs are not equal. Only the coal-fired plant can recover sufficient operating costs to stay in the market and produce electricity. The nuclear plant will shut down. Neither plant recovers its capital cost, so that even the coal plant may exit as soon as another substantial capital improvement must be made to keep the plant operational. But remember, investors will value property based on its prospective income stream, so that if investors expect a shutdown in the future, that expectation is reflected in today's fair market value.

| **POWER PLANT<br>REVENUE AND INCOME<br>REGULATION VS. COMPETITION** | | | | |
|---|---|---|---|---|
| | | **NUCLEAR** | | **COAL FIRED** |
| AGE (YEARS) | | 8 | | 8 |
| SIZE (MW) | | 1,000 | | 1,000 |
| OPERATING LIFE (YEARS) | | 35 | | 35 |
| CAPACITY FACTOR (%) | | 80 | | 80 |
| MWH OUTPUT | | 7,008,000 | | 7,008,000 |
| CAPITAL COST PER KW ($) | | 4,000 | | 1,500 |
| TOTAL ORIGINAL COST ($) | | 4,000,000,000 | | 1,500,000,000 |

| | | | | |
|---|---|---|---|---|
| RATE BASE IN YEAR 8 ($) | | 3,200,000,000 | | 1,200,000,000 |
| PERMITTED RATE OF RETURN=COST OF CAPITAL (%) | | 12 | | 12 |
| RETURN ON & OF CAPITAL ($/MWH) | | 71 | | 27 |
| O&M COST (including fuel) ($/MWH)* | | 25 | | 15 |
| TOTAL REVENUE REQUIREMENT ($/MWH) | | 96 | | 42 |
| ESTIMATED FUTURE MARKET CLEARING PRICE ($/MWH) | | | | |
| OF ELECTRICITY | | 25 | | 25 |
| REV. REQ. EXCEEDS MARKET CLEARING PRICE ($/MWH) | | 71 | | 17 |
| **REGULATION** | | | | |
| NET OPERATING INCOME | | | | |
| (RATE BASE X PERMITTED ROR) | | 384,000,000 | | 144,000,000 |
| TOTAL REVENUE | | | | |
| (NOI + O&M + DEPRECIATION)** | | 672,800,000 | | 294,300,000 |
| **FUTURE COMPETITION** | | | | |
| TOTAL REVENUE (MKT PRICE X OUTPUT) | | 175,200,000 | | 175,200,000 |
| NET OPERATING INCOME | | | | |
| (TOTAL REVENUE LESS O&M AND DEPRECIATION) | | (114,000,000) | | 25,000,000 |
| GROSS CASH FLOW (NOI + DEPRECIATION) | | 0 | | 70,000,000 |
| **Nuclear O&M Cost ($/MWH) includes estimate for cost of long term storage and disposal of spent fuel. Not included in FERC Form I O&M costs, reported FERC Form I costs typically lower.*<br>***This example ignores taxes.* | | | | |

### *Gas Turbine Advances Also Cause A Reevaluation Of Existing Plants*

Once competition is recognized, then technological advances must also be recognized as causing a devaluation of some existing power plants. Lower gas prices, brought about by deregulation and pipeline open access, PURPA's emphasis on small power producers, and the repeal of the provisions of the Power Plant and Industrial Fuel Use Act of 1978 that had prohibited utilities from building gas-fired generators, all have caused an increased emphasis on building gas combustion turbines. The vendors have responded by increasing efficiencies of combined-cycle gas turbine power plants, with heat rates as low as 5950 for an "F" class turbine with triple pressure and reheat, and the new G-series gas turbine, now under development, expected to reach 5860 Btu/kWh under the same conditions. Pollution abatement costs are generally lower than coal units as NOx and carbon monoxide emissions are very low and no sulfur dioxide is produced. Overall, capital costs for combined cycle gas turbine plants are lower than either coal or nuclear plants. They can be built for $450-480 per kWh for 120-MW facilities decreasing to $340 per kWh for 500-MW facilities, with this cost decreasing only slightly for plants larger than 500 MW. A combined cycle gas turbine usually requires a construction lead time of less than 2 years compared to 8-10 years for base load coal plants. Shorter construction time lowers finance charges and reduces risk. Finally, combined cycle gas turbine plants can start quickly, change load rapidly, and shut down immediately, they are therefore much more responsive to the needs of a competitive energy market.

### *Costs Of Environmental Compliance Cannot Be Automatically Passed Through To Ratepayers*

A third important variable affecting plant valuation will be through environmental laws and regulations governing air emissions from power plants. In a competitive market, the cost of abatement equipment cannot be included in rate base and cause income to increase. Rather compliance capital costs cause income and property value to fall. Prospective investors in a power plant will recognize two of at least several environmental changes which may affect the profitability of their investment: (1) a FERC-mandated allowance trading program for pollutants, and (2) more stringent NOx emissions limits, particularly for coal-fired power plants. A cap and trade program has already been attached to Senator Dale Bumper's restructuring bill, and will likely be added to other restructuring bills now pending in Congress. Under the plan, the FERC would set pollution caps for each pollutant. It would give credits to efficient facilities through the which the less pollution they produce, the more credits they would receive. Those who have generated insufficient credits must purchase credits from others who have generated excess credits. What this would mean is that relatively high polluting generators would have a choice of installing new pollution control technologies or buying credits from cleaner generators.

Second, the EPA is now working on regulations to reduce nitrogen oxide. Their target appears to be utilities. There is a related risk that the Clean Air Act provisions that allow grandfathering of certain coal-fired power plants would be repealed, once again inhibiting the ability of coal-fired plants to compete. This repeal will be all the more likely if Congress approves the NOx limitations in the Kyoto Treaty. But the treaty will not likely be sent to the Senate for ratification before the November elections and many senators have already called it dead on arrival.

While some of the costs of these future environmental requirements may *today* be too uncertain to be recognized as significant value diminishers, the affect on plant value can occur almost overnight. Once legislation or regulations are imminent, fair market value is affected because investors look to the future. By the time a compliance date arrives, it may be too late to obtain all of the possible tax savings.

### *Incorporating These Changes Into A Current Power Plant Valuation*

Depending upon state law, property is valued either at the "unit" level by state assessors or locally on a location-by-location basis. In a unit assessment, all utility property: generating, distribution and transmission, is valued as a whole and then its value is allocated to the taxing jurisdiction. In a local assessment, each piece of property, which could be transmission wires, poles, and substations, or a single generating plant, is valued by a local assessor on a town, township, city or county basis. The effect of the industry changes can best be understood by starting at the local level.

First, the utility can apply an income approach to value by estimating the prospective income the generating plant is expected to earn. This approach will depend upon reasonable projections of the market price of electricity facing a particular generating plant and an estimate of the plant's dispatch at the projected electricity prices. Just as revenues must be projected and present valued, operating costs, such as fuel prices, must be projected and present valued. The necessary studies can be commissioned from energy and economic forecasting firms, specifically for the plant at issue, or the appraiser could use studies available from the Energy Information Administration or the Gas Research Institute, emphasizing a more global perspective.

Moreover, the utility may be able to use price projections it has used for stranded cost recovery studies. The studies typically provide the portion of net book cost the utility would not likely recover, and by extension, what an investor would not likely purchase. If the assessment is based on net book value such studies will be useful to benchmark property values. Depending upon the quality of the study it may be combined with competent appraisal evidence, and used to prove a value reduction in court.

A truncated projection is also possible with an income projection based on a rate base times permitted rate of return for several years, converting to a market price income projection for those portions of the load that will be sold in competitive markets. If the plant is already producing primarily for a wholesale market, arguably competitive prices should be projected from today forward.

State law would have to be examined to determine if using an income stream based on rate base or including stranded cost recovery allowances would be either improperly finding the value of the property "in use" to its owner rather than its fair market value or valuing intangible assets. Fair market value is based on hypothetical buyers and sellers in the market place. If the only buyers would be independent power producers, their purchase price would be based only on the value of the tangible assets. Only the utility -- not an independent power producer -- would have the ability to collect both income from rate base or stranded costs. The situation may be analogous to the homeowner installing an expensive swimming pool; the home's value-in-use to the owner has risen but its market value may have actually fallen. But its market value is the basis for property taxes. There is a related issue for non-utility generators. Under most state laws, prices from above-market power purchase agreements should not be used to project income as such an exercise values the non-taxable intangible contract rights rather than the tangible property comprising the power plant.

Next market sales of power plants comparable to the appraised plant should also be investigated. Now with disaggregation and competition such sales are occurring more frequently. But such sales are likely to include the prices for power purchase agreements, stranded cost recovery rights, other intangible contract rights, indemnification for various liabilities such as nuclear fuel disposal costs, other environmental liabilities, and other assets or costs not directly related to the tangible or taxable property. Rather, it is quite possible that the value of just the taxable tangible assets can be determined reliably only by the cost or income methods.

The replacement cost less depreciation approach must also be considered as it will set the upper limit on the value of the plant: even if the plant can make substantial profits at the market price of electricity, an investor will not pay a price based on its discounted income stream if the investor can purchase and operate a brand new plant for less. The replacement plant of choice under today's market conditions is likely to be a combined cycle gas turbine plant. First the capital cost per kilowatt hour of producing the equivalent amount of electricity must be calculated. This can be done through industry publications, vendor proposals, or more appropriately, by an independent engineering firm. The capital cost should be increased by startup costs, necessary spare parts, and interest expense during the construction period, among others. From this cost for a new plant must be deducted an amount appropriate for the physical deterioration suffered by the appraised plant. This can be done by comparisons of the useful life of the new facility versus the useful life of the appraised facility. Next the fuel cost between the two subjects must be compared. If the appraised plant is oil or gas-fired, then the replacement gas plant's lower heat rate and lower overall fuel costs will be reflected by a reduction from the value of the appraised plant for its excess fuel costs. If the appraised plant is nuclear or coal-fired, it is quite likely there should be an addition in value to the appraised plant relative to the replacement plant because coal costs less than gas per MWh of electricity produced. Nuclear fuel costs less than gas as well, but arguably, if nuclear fuel disposal costs are considered a cost of fuel then any advantage likely disappears. Next all other fixed and variable operating costs per kilowatt of capacity will have to be compared with a reduction in the value of the appraised plant being made if the costs are lower for the replacement facility than the appraised plant and the value increased for the appraised plant if the replacement facility's costs are higher. All future yearly cost estimates must be present valued to reflect the total cost comparison as of the appraisal date.

Finally, an additional deduction in value may be made for economic or external obsolescence. The appraiser must determine if the projections of the market price of electricity would allow the purchaser to recover all costs. If there is excess capacity in the market so that competing plants in the market area of the appraised subject are likely to sell marginal cost electricity (i.e. electricity priced so low it does not recover capital costs), it is likely the replacement facility could not recover its capital costs. A deduction should be made for these unrecovered costs. In the long run, however, the market price of electricity should be high enough to allow recovery of both capital and operating costs of the most efficient operating units as marginal plants exit the market.

The above principles are illustrated in a simplified mathematical example for a coal plant:

COST APPROACH FOR COAL-FIRED GENERATING PLANT
with an effective age of 9 years based on its current condition

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|---|---|
| 1 REPRODUCTION COST OF COAL PLANT ($1,000/KW x 650,000KW) | $ 650,000,000 |
| 2 REPLACEMENT COST NEW OF GAS COMBINED CYCLE PLANT ($400/KW X 650,000KW) | $ 260,000,000 |
| 3 COAL PLANT'S FUNCTIONAL OBSOLESCENCE (EXCESS CONSTRUCTION) (Line 1 - 2) | $ 390,000,000 |
| 4 PHYSICAL DEPRECIATION (EFFECTIVE AGE/AN ECONOMIC LIFE OF 40 YEARS) 22.5% | $ 58,500,000 |
| 5 OPERATING COST ADVANTAGE OF COAL PLANT (5f - 5e) | $ 46,500,000 |
| 5a O&M COST PER KWH OF APPRAISED COAL PLANT AT YEAR 1 ($1997) | $ 0.01717 |
| 5b O&M COST PER KWH OF REPLACEMENT GAS PLANT AT YEAR 1 ($1997) (FUEL COST ADJUSTED WITH DOE/EIA REAL DOLLAR INDEXES GAS INDEX INCREASES MORE RAPIDLY THAN COAL INDEX) | $ 0.01607 |
| 5c O&M COST PER KWH OF APPRAISED COAL PLANT AT YEAR 15 ($1997) | $ 0.01807 |
| 5d O&M COST PER KWH OF REPLACEMENT AT YEAR 15 ($1997) | $ 0.02224 |
| ANNUAL KWH PRODUCTION | 4,750,000,000 |
| 5e PRESENT VALUE O&M COSTS OF APPRAISED COAL PLANT | $ 717,500,000 |
| 5f PRESENT VALUE O&M COSTS OF REPLACEMENT GAS PLANT | $ 764,000,000 |

| | |
|---|---|
| 6 EXTERNAL/ECONOMIC OBSOLESCENCE | $ 18,000,000 |
| REPRODUCTION COST NEW LESS DEPRECIATION (Line 1 minus Line 3 minus Line 4 plus Line 5 minus Line 6) | $ 230,000,00 |

Notes: Most figures are approximations. Capital costs include direct and indirect expenses such as contractors' profit margins and financing costs. Coal plant operating costs do not include possibly increasing environmental compliance costs. External/economic obsolescence is created hypothetically by assuming the present value of total yearly electrical output of the plant times each year's estimated market price of electricity would equal $230 million. This capitalized amount of gross revenue would not cover a value based only on the appraised plant's operating and depreciated capital costs of $248,000,000. It is an indication, that at least in the short run, the regional electric market served by the plant has electricity prices below the fully recovered costs of state-of-the-art generating facilities. This condition would likely occur, for example, whenever coal plants are producing at marginal cost. As the investor would not pay for costs that would not be recovered, the appraiser must reduce the appraised value by $18,000,000 ($248 million - 230 million) to arrive at an appraised value from the cost approach recognizing all forms of obsolescence: functional, physical and economic.

## *Changes For Unit Value States*

For the utilities in the approximately 36 states that have their property valued by the unit method, the above techniques are also applicable. The unit should be broken into those components that are likely to remain rate-base regulated such as transmission and distribution, with those assets being valued through traditional unit value techniques. Next, the assets that are likely not to be subject to rate base regulation will have to be identified, most likely the generating assets. A determination will have to be made as to when they will be severed from the unit, or at least, no longer be allowed to earn an income based on rate base times a permitted rate of return. After that date, the above local valuation techniques will have to be applied. The overall value for the unit will be a combination of the values of the assets that will remain regulated combined with the value of the soon to be deregulated assets. The value of the soon-to-be deregulated assets will be a combination of their value in a regulated for a certain number of years and their remaining value in a competitive market.

## *Conclusions*

As the above-described effects of deregulation, technological advance and environmental changes are reasonably predictable today, they are affecting investor expectations, and hence value, today. Buyers and sellers look to the future. Following the above-described techniques can help establish the magnitude of these impacts on the value of power plants and other electric utility assets. In any event, if the utility waits until the effects actually occur (i.e. the plant is actually shut down for non-compliance with environmental regulations, a nuclear power plant is mothballed because of increased maintenance and operating costs, or a plant's dispatch rate drops precipitously) then it is fair to say that the utility will have been paying excessive property taxes in many of the years preceding the impact.

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