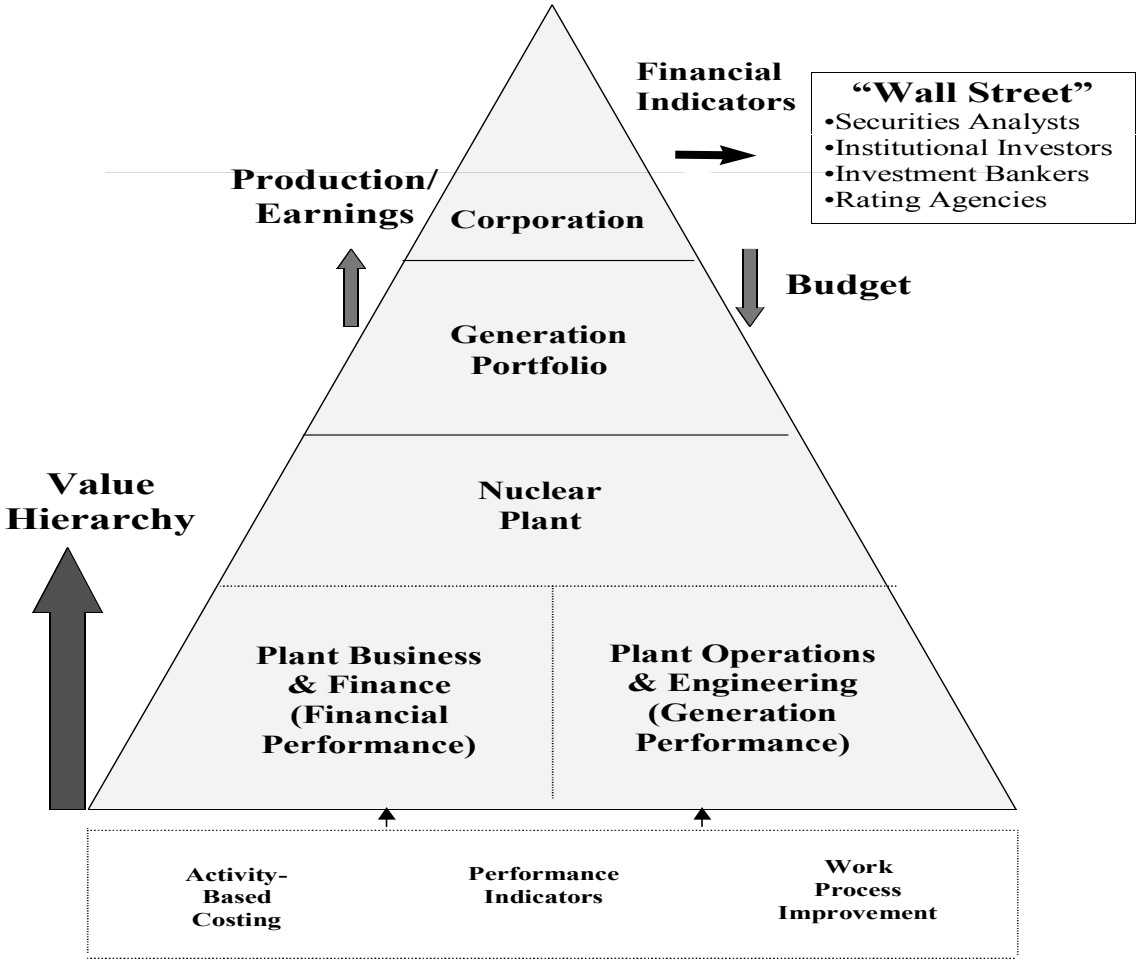
Nuclear Power Financial Indicators for a Competitive Market

Technical Report



Standard Nuclear Performance Model
(NEI / EUCG)

Nuclear Power Financial Indicators for a Competitive Market

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Final Report, September 2001

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REPORT SUMMARY

Increasingly, nuclear power owners realize that a common set of critical performance indicators would promote the long-term operational and financial success of their plants in a competitive environment. Financial indicators identified in this report should prove crucial in valuing plant performance by the investment community and in setting quantifiable goals at all levels of a nuclear-generating company. This project was conceived and supported by the Nuclear Asset Management Users Group (NAMUG).

Background

All nuclear plants have a set of performance indicators with roots in the economically regulated electricity industry. Many nuclear power owners, experienced in traditional engineering and safety/economic regulatory disciplines, realize that a plant's long-term operation and financial success in a competitive industry can be fostered by a common set of critical performance indicators. Increasing the visibility of financial objectives within the current set of performance indicators will directly support profitability. This project uses the term "financial indicators" for performance indicators that correlate strongly with financial objectives. Some financial indicators track competitive positioning (profitability) and others measure safety, technical, or operational objectives essential to power production. Financial indicators can be used to plan and measure financial performance, as well as to set quantified goals for the company or elements of the company (for example, staff members and organizational units). NAMUG and other EPRI-member representatives at the June 2000 Nuclear Asset Management Workshop (proceedings, EPRI report TR-114967) gave high priority to the subject of nuclear power financial indicators for a competitive market.

Objective

To identify a set of nuclear power financial indicators that are critical for the long-term viability and economic success of a nuclear enterprise (corporation, plant, or fleet of plants).

Approach

A financial consultant, with experience as a securities analyst specializing in electric utilities, issued and evaluated a survey of Wall Street analysts in the areas of equities, fixed income, rating agencies, and investment banking and management firms. Wall Street analysts were selected for the survey because of their emphasis on profitability and their influence on investor perception. The survey asked which indicators have been used in the regulated electricity industry and which would be most helpful in a competitive marketplace. Next, Duke Energy reported the financial indicators it uses and compared them to indicators used by five other nuclear owners. Finally, the Wall Street responses and nuclear owner indicators were consolidated to provide the financial indicators discussed in this report. (Some of the indicators

are proposed for transmitting to Wall Street so that all generation companies will be valued on a common basis, or level playing field. Others are for use by plant or corporate management to evaluate business on a regular basis. Both types of indicators are intended to be measures of a generation enterprise's overall financial health.) Financial indicators used by the airlines and telecommunications industries provided a comparison for validating the Wall Street survey results.

Results

Responses from the Wall Street and plant owner surveys form the basis for a list of proposed financial indicators in the categories of valuation, profitability, productivity, operating cost, and compliance with safety regulations. The list is essentially an extension of performance indicators defined by the Nuclear Energy Institute/Electric Utility Cost Group (NEI/EUGG) Standard Nuclear Performance Model (SNPM). Also identified are other factors affecting plant and company valuation, including nuclear fuel advantage, stranded cost recovery, plant location, license renewal, environmental credit, and operating risks.

EPRI Perspective

With the advent of competition, the nuclear industry could benefit by adopting consistent financial indicators and providing some of them to analysts. Other indicators could be used internally for launching strategic objectives, setting quantitative performance goals, tracking progress, increasing profitability, enhancing plant value through resource allocation, and appraising financial management performance. Providing analysts with an improved set of financial indicators would lead to more accurate valuations, thereby establishing a more level playing field and enhancing nuclear enterprise access to capital. This information also would help the investment community appreciate the nuclear industry's potential cost advantages in a competitive market or, more importantly, its ability to contribute earnings and earnings growth.

Along with license renewal and physical plant asset management, financial asset management is the responsibility of the EPRI Life Cycle Management Technology Advisory Committee. EPRI is coordinating its nuclear asset management activities with other organizations engaged in such activities—NEI, EUCG, and the Institute of Nuclear Power Operations (INPO).

Keywords

Financial asset management
Life-cycle management
Competition
Nuclear performance indicators

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The following charter-member utilities and representatives of the 2000 Nuclear Asset Management Users Group initiated this study:

Duke Energy	J. Baughman
Exelon	E. Hunt and G. Wald
Omaha Public Power	J. Gasper
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Pacific Gas & Electric	H. Phillips
PPL Generation—Susquehanna	L. Olah
Rochester Gas & Electric	J. Fischer
STP Nuclear Operating Company	K. Cornett
Tennessee Valley Authority	D. Green

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American Electric Power	B. Auer
Calvert Cliffs Nuclear Power Plant	M. Navin
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First Energy Corporation	B. Davis
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EXECUTIVE SUMMARY

This EPRI study—cosponsored by members of the Nuclear Asset Management Users Group (NAMUG)—proposes that the financial indicators in the table below be considered for use by both nuclear owners and Wall Street investment analysts. Nuclear owners are beginning to view each unit or plant as a business enterprise. Ultimately, each owner will decide what information to communicate to Wall Street. Equity analysts of course recognize that some information may not be communicated due to the sensitive nature of the data in a competitive industry.

We arrived at these proposed financial indicators by having a financial consultant with experience as a Wall Street analyst compile and analyze survey responses from peer analysts. The survey asked which indicators have been used in the regulated electricity industry and which are viewed as being more appropriate and useful in the coming competitive industry.

Next, Duke Energy reported the financial indicators it uses and compared them both to indicators used by five other nuclear owners as well as indicators specified in the Nuclear Energy Institute (NEI)/EUCG (formerly Electric Utility Cost Group) Standard Nuclear Performance Model.

Finally, the Wall Street responses and nuclear owner indicators were consolidated to give the financial indicators in the table below. All of these indicators would be applicable and useful only in a fully deregulated industry (i.e., some may not be appropriate to use for an enterprise in a transition period).

In addition to the quantitative financial indicators, the following qualitative factors (difficult to quantify with a single indicator) were identified as having a significant effect on the value of nuclear power enterprises in a competitive industry:

Nuclear Fuel Advantage
Stranded Cost Recovery
Plant Location
License Renewal
Environmental Credit
Operating Risks

The airlines and telecommunications industries deregulated earlier than the electricity industry and are also capital intensive. The airlines share the issue of safety with the nuclear power industry. We examined the financial indicators used by these industries and validated the Wall Street survey results that cash flow valuation indicators/methods and asset utilization indicators will become more important for the electricity industry.

The nuclear industry could benefit from adopting consistent financial indicators and providing at least some of them to analysts. Other indicators could be used internally for launching strategic

objectives, setting quantitative performance goals, tracking progress, increasing profitability, enhancing plant value through resource allocation, and appraising financial management performance. Providing analysts with an improved set of financial indicators would lead to more accurate valuations, thereby establishing a more level playing field and enhancing nuclear enterprise access to capital. Providing nuclear power management with an improved set of financial indicators would increase their ability to assess their business practices and perform benchmarking.

For the valuation category of indicators in the table below, providing data will facilitate the investment community's understanding of nuclear profitability and financial health. This heightened transparency should result in an equity market valuation that can balance the measurement of risk and return while resulting in more accurate analysis of the short- and long-term earning power of the enterprise.

Clear, concise, uniform definitions of the operational category of the financial indicators should also serve the nuclear industry's best interest. This is particularly important in the areas of production, non-fuel O&M, and busbar costs. Monitored continuously, these indicators will allow owners and managers to gauge business progress. Monitored and reported consistently, this information would help the investment community appreciate the nuclear industry's potential cost advantages in a competitive market or, more importantly, its ability to contribute earnings and earnings growth.

The nuclear enterprises addressed by the study include individual nuclear plants viewed as business units; entire nuclear plant fleets; smaller, predominantly nuclear generation companies; and large generation companies with various mixes of nuclear and fossil plants. Some indicators (such as capacity factor) clearly relate only to a plant or fleet of plants. The extent to which nuclear plant indicators influence the value of a company's stock depends on what fraction of total generating capacity owned by the company is nuclear.

Of course, any movement toward making the information provided to Wall Street more consistent among nuclear power companies cannot take priority over a company's right to act as a completely independent unit in the coming competitive electricity industry. Information is provided to Wall Street entirely at the discretion of owners.

NEI has reviewed these financial indicators and concluded that if its member owners and operators adopt any or all of the recommendations, selected indicators may be added to the performance indicators in a revised SNPM version.

Almost all of the indicators identified in this study also apply to power plants and companies using other generation technologies (fossil, hydro, etc.). It may be useful to treat such applications in a future study.

Nuclear Power Financial Indicators

Indicators		What they are	What they indicate/measure
VALUATION INDICATORS			
Price/Earnings Multiple (P/E) (1)	C(2)	Price of stock share divided by future earnings per share (usually current price and one-year earnings projection).	What investors are willing to pay per dollar of reported profits or projected growth.
Firm Value/EBIT (or EBITDA)	C	Company's assets less debt divided by earnings.	Potential of a company to use assets to generate earnings.
Net Present Value (NPV)	C,P	Sum of all future cash flows discounted to present day; represents the company, plant, or project value to the owner (over and above the market's required rate of return for an investment of similar riskiness) and the incremental value to an acquiring company. (Analysts view nuclear power as more risky than other forms of generation.)	Discounted Cash Flow is used to calculate NPV, which is the most fundamental measure of value. It is especially applicable to acquisitions of companies or nuclear assets.
Internal Rate of Return (IRR)(3)	C,P	Discount rate for which the present value of a company's or project's expected cash inflows equals the present value of the company's or project's cost; this rate gives an NPV of zero.	For an analyst, IRR measures the return that a company/plant owner achieves from an investment in a plant.
PROFITABILITY / INTEGRATED FINANCIAL RATIOS			
Return on Equity (ROE)	C,P	Net Income / Average Shareholder's Equity	How well a firm utilizes its equity. Should be analyzed over time and across utilities.
Return on Assets (ROA)(5)	C,P	Net Income/Average Total Assets (expressed as a percentage)	How efficiently a firm utilizes its capital. Provides a comprehensive measure of profitability during a given period.
Operating Margin	C,P	Operating Income/Revenues expressed as a percentage	Ability to generate profits normalized with respect to total revenue (measure of company size).
Profit Margin	C,P	Net Income/ Revenues expressed as a percentage	Profits relative to cost of generating electricity.
Future Capital Requirements (4)	C,P	Annual investment needed to run company or operate plant to the end of its licensed term.	For a nuclear plant, investment needed to run to the end of current licensed term or to benefit from an additional 20 years of operation.
Earnings Before Interest and Taxes (EBIT), Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA)	C,P	Earnings Before Interest and Taxes: Earnings Before Interest, Taxes, Depreciation and Amortization	Cash flow indicators will be more relevant in a competitive market than traditional book earnings measures.
Debt-to-Equity Ratio	C	Total value of business debt divided by total value of equity.	Relative indebtedness of a company.

ASSET UTILIZATION / PRODUCTIVITY INDICATOR

Capacity Factor	P	Power produced in a period expressed as a percentage of the maximum power a unit is capable of producing in that period.	Power produced in a period expressed as a percentage of the maximum power a unit is capable of producing in that period.

OPERATING COST INDICATORS

Production Cost ($/MWh)	P	Non-fuel O&M plus fuel cost divided by MWh produced.	Useful for valuation and benchmarking.
Busbar Cost ($/MWh)	P	Cost of producing one kWh of electricity delivered to, but not through, the transmission system; consists of non-fuel O&M cost (including capital cost), fuel cost, depreciation, interest, and administration and general charges (A&G).	Useful for valuation and benchmarking. Provides a more in-depth view of costs than the production cost indicator.

REGULATORY and PERFORMANCE INDICATORS

Nuclear Regulatory Commission (NRC) Performance Indicators (3)	P	Technical parameters reflecting minimization of events that could lead to an accident; ability to mitigate accident severity and release of radioactivity; emergency preparedness; and radiation protection of plant staff /public as well as physical protection of fuel/plant during routine operation.	NRC's assessment of plant's readiness to maintain an acceptable level of public health and safety.
INPO Performance Indicator Index (4)(5)	P	A weighted composite of WANO plant performance indicators.	Plant technical performance (safety and production).

Notes:

(1) In some cases, Price/EBIT (or EBITDA) is used. EBIT is Earnings Before Interest and Taxes; EBITDA is Earnings Before Interest, Taxes, Depreciation and Amortization.
(2) Indicator can be applied to the following: C = company (with nuclear plants, other generation technologies, or both); P = plant (or fleet of plants).
(3) Public information available to Wall Street.
(4) Not generally available to public; can be made available to Wall Street at the discretion of the owner.
(5) For use mainly by *plant* asset managers—other indicators for use by plant/company asset managers (and Wall Street analysts, if data are reported).

1
INTRODUCTION

Nuclear power plants, as baseload suppliers of electricity, represent major corporate assets. Under economic regulation wherein electricity prices and shareholder rates of return were specified, traditional business practice focused on safety and revenue requirements. Financial risks were borne primarily by the ratepayer.

In a competitive, market-driven industry, safety of the public and personnel remains the primary focus of plant operation. However, the successful, long-term operation of a nuclear plant needs to be viewed both as an independent business enterprise and as a valuable element of its owner's portfolio. To compete with energy from natural gas and coal, the enterprise must be able to offer a lower power price to the market in the long run by being cost-effective and maximizing returns for investors.

In the competitive era, there is a need to apply a consistent set of critical economic success factors for nuclear plants. Some of the success factors are useful to equity market analysts for valuing companies. To maximize economic success, nuclear owners will not only focus on "Wall Street" factors, but also on other factors that are important for supporting strategic and operational nuclear asset management at both plant and corporate levels. Figure 1-1 shows a nuclear asset management value pyramid. The pyramid illustrates the flow of productivity and earnings from the lowest plant level up to the corporate level and company information flowing to Wall Street.

Useful tools for physical and financial asset management in any business enterprise are "indicators" (also known as "performance indicators" or "performance measures"). Indicators are measurable parameters correlated with the degree to which an enterprise (e.g., a company or industrial facility) meets one or more of its strategic objectives. Indicators are used both to measure performance and to set quantified goals for the company, company organizational units, or staff members. The "performance" can relate to either operational performance or financial performance. This study uses the term "financial indicators" for performance measures that correlate strongly with financial objectives.

Many indicators for nuclear plants are in widespread use. For example, the World Association of Nuclear Operations (WANO) has adopted the Institute of Nuclear Power Operations (INPO) indicators, most of which are technical (1). Moreover, the Nuclear Regulatory Commission (NRC) applies safety performance indicators, none of which directly relate to economics (2). Almost all these indicators correlate with either safety performance (e.g., Unplanned Scrams) or engineering efficiency (e.g., Thermal Performance). (A "scram" is an emergency plant shutdown usually triggered by a safety concern. "Thermal performance" is the amount of fuel energy converted into thermal [heat] energy [which is subsequently converted into electrical energy]).

In recent years, NEI and EUCG have collaborated on a Standard Nuclear Performance Model (SNPM), which includes a large "set of performance indicators consistent with INPO guidance" (3). The indicators range from lower level measures of the effectiveness of processes such as plant operation, work management, equipment reliability, and materials and services to higher level "overall business" measures. These include Capacity Factor, WANO Performance Index (same as INPO Performance Indicator Index), and production cost. No specific attempt was made by the SNPM effort to identify additional performance measures (corporate financial indicators) as critical success factors. Although some of the SNPM performance measures are also financial indicators, the effort emphasized plant performance rather than company financial performance. NEI/EUCG plans to incorporate some of the EPRI/NAMUG proposed financial indicators into the next SNPM revision .

The value pyramid in Figure 1.1 presents an overall view of how detailed plant indicators (see the lowest section of the pyramid) flow up to the plant, portfolio, corporate, and Wall Street levels. In the process of tying the upper level indicators from this report with the lower level indicators in future evolutions of SNPM, the role that all indicators play in the roll-up to stockholder value can be illustrated on a similar diagram. This will emphasize that all indicators must have a role to play in the big picture of financial success and that each of the indicators can be assigned for primary use to one of the levels in Figure 1.1.

EPRI and NAMUG conceived this project to identify additional financial indicators useful to nuclear plant owners and operators. NAMUG is a group of EPRI-member utilities interested in developing improved technology in the area of financial asset management. It is a working group of EPRI's utility Life Cycle Management Technology Target Subcommittee. The subject of nuclear power financial indicators is high on a list of asset management topics that the nine charter members of NAMUG and other EPRI members have prioritized for study.

The nuclear enterprises addressed by the study include 1) individual nuclear plants viewed as business units; 2) entire nuclear plant fleets; 3) smaller, predominantly generation companies; and 4) large generation/integrated companies with various mixes of nuclear and fossil plants.

It is important to note that almost all of the indicators to be recommended apply not only to nuclear power, but also to fossil, hydro, and other generation technologies. However, it is beyond the scope of this report to address aspects of financial indicators as they may apply to other generation technologies (e.g., for non-baseload technologies, capacity factor is not as relevant an indicator as availability).

The intended audiences for this report are threefold:

- Wall Street analysts (for supporting their mission of providing investors with sound, objective information).
- Nuclear enterprise executives and high-level managers (for putting strategic objectives into action, setting quantitative performance goals, and tracking progress toward those goals).
- Nuclear plant personnel (for improving their business acumen and gaining a better understanding how their jobs can contribute to the financial success of their company).

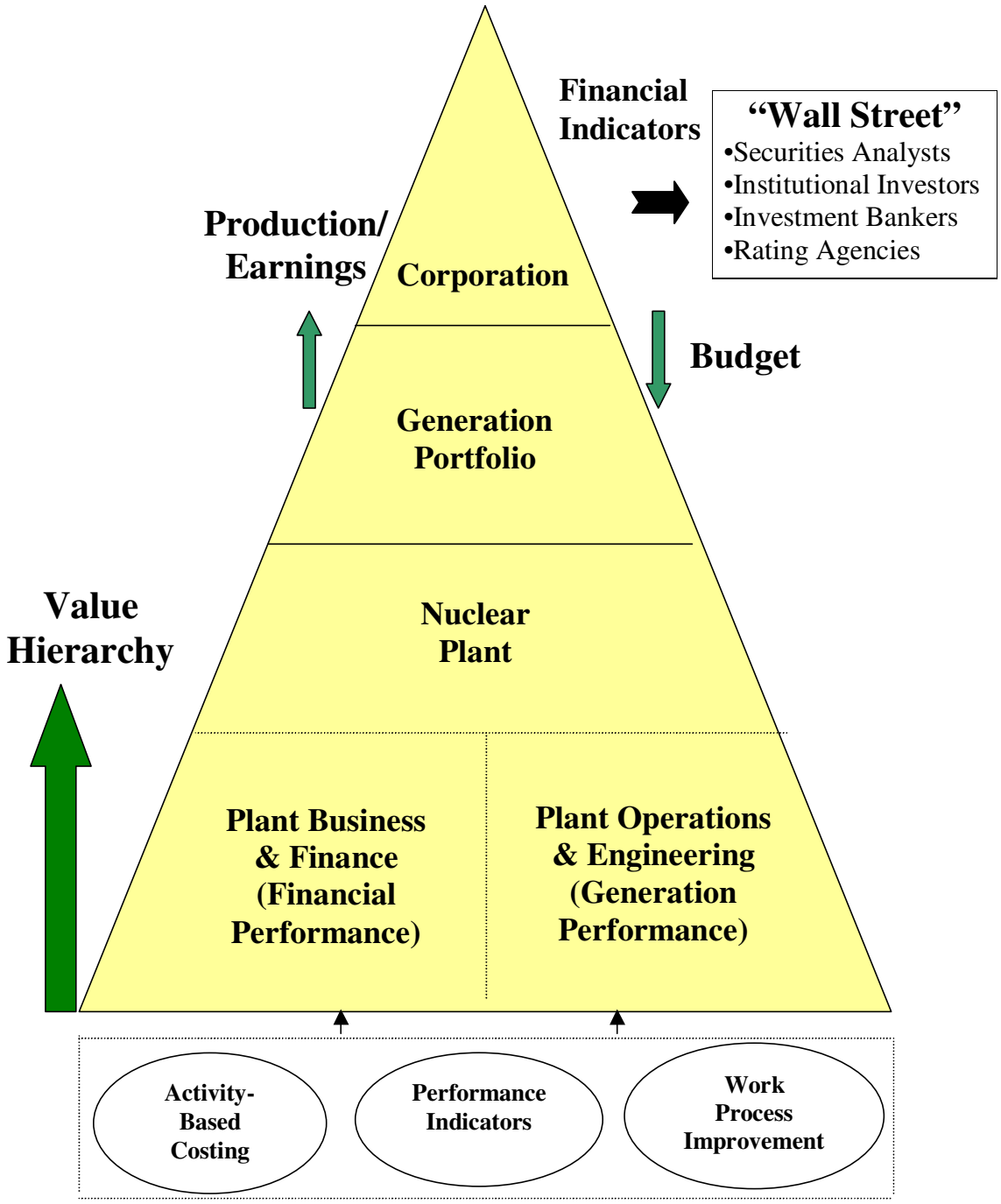

Figure 1-1
Nuclear Asset Management Value Pyramid

2
WALL STREET PERSPECTIVE

Competition in generation will affect the indicators that the securities market (Wall Street) uses to assess financial performance and value of generation plants as well as the companies that own them. In this section, we propose nuclear power financial performance indicators, mindful of the Wall Street perspective.

In the economically regulated electric industry, Wall Street looked to process-oriented operational indicators, such as capacity factor and unit cost of production, to judge management competence and performance. Wall Street analysts also relied upon the NRC for safety records. However, the main area of focus for financial performance was a company's capital spending on a plant, since return on rate base regulation made operating results less important for profitability. However, with competition in generation, analysts' use of both the operational performance indicators and others identified in this report will become more important for measuring financial performance and stock market valuation than in the past.

2.1 Description of Wall Street Valuation

How do Wall Street analysts use nuclear financial indicators to value equities and companies? What are the current sources of information? What do the analysts do with the information?

The market itself values the equity of a company. The stock price is the measure of the equity value to *today's* investors. Today's value of the company is the price per share times the total number of shares outstanding. The Wall Street analyst examines information about a company and evaluates whether, based on company data and other factors, the equity as measured by market price of the stock is overvalued or undervalued.

An important mission of analysts is to be an unbiased source of information to investors. Analysts review information about plant and company performance produced by the Federal Energy Regulatory Commission (FERC) Form 1, the NRC, NEI, the Securities Exchange Commission (SEC) filings, and interviews with the company's management and competitors.

After reviewing all available information, analysts attempt to "value" the company's stock using mainly the indicator of price-to-earnings multiple or ratio (P/E). This indicator is a measure of a stock's ability to generate future earnings and dividends. The actual P/E is defined as the current price of the stock divided by a one-year projection of earnings per share (usually reported by the company) It is significant that the current price is known with certainty, whereas next year's earnings projection is uncertain. The P/E assigned by the analyst reflects his or her view of what the stock will be worth in view of the company's prospects for growth.

The analyst uses various other financial indicators and factors influencing value to estimate the assigned P/E the stock "should" have relative to the calculated P/E. For example, a plant or generating company may appear healthy if 1) it has a strong operating track record likely to continue in the future and 2) is likely to achieve above-average future earnings growth attributable to a baseload, low-cost position in a high electricity price market. In this case, the analyst will judge its stock to be worth more by assigning it a higher value than reflected by the current market P/E.

Another indicator potentially useful to an analyst's stock valuation is the company's estimated net present value (NPV) per share, in contrast to the net asset value established by the market. Conventionally, the calculation of NPV is performed using the discounted cash flow (DCF) technique to convert long-term future cash flow estimates to their present value, using a discount rate. Although this method may be viewed as giving the "true" value of a company, it was and is used infrequently by analysts. This is because the many estimated parameters needed for the calculation—such as weighted average cost of capital, forward power price, cost of operation, terms of power purchase contracts, etc.—are not known with any certainty, so the calculated value was viewed as too uncertain to be useful. With restructuring, analysts will likely focus on and apply more effort to this method, especially to evaluate company acquisitions of generation facilities.

During the last decade, the state of the art in calculating plant and company NPV using DCF has advanced beyond conventional DCF analysis by incorporating additional value attributed to the option plant owners have to retire prior to the expiration of the current license or to operate beyond it. The options value is correlated with market risk, with the main driver being the market price of electricity as a commodity. In the process of providing technical tools to support the license renewal for U.S. plants, EPRI has developed the Nuclear Options Model (8) for calculating improved estimates of NPV using options pricing theory. Currently, EPRI is developing the Nuclear Asset and Project Evaluator software (_), which evaluates and ranks plant improvement projects using options theory. Adoption of option value by the financial community is increasing as the importance of this relatively new concept becomes more understood and recognized( ).

The improved financial indicators we are seeking here are tools or yardsticks for an analyst. The better the information analysts have access to in terms of robustness, objectivity, and consistency among competing companies, the better they can fulfill their mission. A detailed explanation of how analysts use other financial indicators as a basis for assigning a P/E (or calculating an NPV) of a company is beyond the scope of this study.

2.2 Survey Results—Current and Historical Financial Indicators

In exploring factors that could be used as financial indicators, we first consider the historical indicators and how they are used in today's transitional period of nuclear power economics.

In 1998, NEI in collaboration with EUCG and INPO proposed a Standard Nuclear Performance Model (3). There were three principal tenets that the study proposed, including a comprehensive process model using all INPO and NEI processes, cost definitions, and plant performance indicators. These standards were created to improve benchmarking efforts and allow comparison

of information among plants. NEI performance indicators used by Wall Street analysts and utility investors include capacity factor, production cost, outage duration time, capital cost, and forced outage rate. These indicators and Wall Street experience were considered in the preparation of a survey issued to equity analysts and institutional investors.

The Wall Street survey (see Appendix A) examined which financial performance indicators are widely used and how their use might change with competition in generation. The survey was sent to 24 investment analysts. Responses were received from 16 (see list in Appendix B).

The second column of Table 2-1 gives the results of the survey in terms of the percentage of responses that identified an indicator as being used in the regulated industry of the past and the current transitional market. Results for the future competitive market in the third column are discussed in the next subsection.

Table 2-1
Financial Indicators Used by Analysts in the Transitional Market Environment and Desired for Use in the Future

Indicator	Transitional Market Historical / Current	Competitive Market Future
Capacity factor	100%	100%
Production cost (non-fuel O&M plus fuel cost)	69%	100%
Capital expenditures (also included in busbar cost)	75%	94%
Availability	75%	93%
Decommissioning funding	50%	75%
Busbar cost (non-fuel O&M cost, fuel cost, depreciation, interest, and administration & general charges (A&G).	82%	75%

Source: EPRI Survey of Financial Analysts

What appears to be the rationale for the survey responses? First, in the return on rate base regulation environment, analysts wanted to know that a plant was running well. Hence, we note that capacity factor and outages and refueling time were the most important factors as asset utilization indicators. If a plant or company's nuclear fleet ran well, management was viewed as being competent. Therefore, indicators such as capacity factor, outages, and refueling time also provided qualitative indicators about management. Production cost was less important in the return-on-rate-base environment because the company was earning a return on the total assets as per its regulation. Surprisingly, busbar cost was viewed as less important in a market-driven industry, perhaps because accounting methods for depreciation and A&G vary widely. Second, in today's transition environment, attention to these asset utilization financial indicators has become more important to Wall Street because they reveal how profitable an asset can be in the future and how competent the management is at operating the plant/company. Analysts give more credence to a management's ability to operate in a competitive market if it has demonstrated it can operate well in the past.

2.3 Survey Results—Competitive Market Financial Indicators

Management will have to prove to the investment community that plants can generate electricity efficiently and profitably without return-on-rate-base regulation. In a competitive generation market, most analysts indicated that they will rely more upon asset utilization indicators for examining financial performance indicators such as capacity factor, production cost, busbar cost, and capital requirements (see Table 2-1). The use of capacity factor will indicate how much revenue is generated by a plant/company. Analysts will study production cost of plants/companies because these issues will indicate how a plant's costs compare to other types of generation facilities. These indicators will help determine how profitable a nuclear plant/company will be in a competitive market. While capital spending was important in the return-on-rate-base, in the competitive market it will indicate how much incremental cost a plant/company will bear and therefore how profitable it will be in the future.

According to the survey results, other factors of more importance in a competitive market will be capital expenditures and decommissioning funding. Analysts will monitor capital spending in a competitive market to indicate returns on capital and cost-competitiveness. Analysts rated decommissioning funding as more important in a competitive market because they fear that the risk of being under-funded may be borne by the shareholder.

In our survey, we learned that analysts prefer the use of cash flow indicators for valuation over traditional P/E multiples and firm value per MW benchmarks in reviewing recent nuclear acquisitions in the marketplace. Analysts consider how much cash flow the assets must earn to recover the capital invested and to earn a return that is greater than the cost of capital.

The majority of analysts surveyed favored the use of Earnings Before Interest and Taxes (EBIT) and Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). They also favored NPV and Internal Rate of Return (IRR) to measure value in a competitive market if sufficient information was available.

Consequently, analysts use EBIT and EBITDA to calculate the contribution to plant cash flow and income. If sufficient information is available, analysts use DCF and IRR methodologies to measure value of a particular plant. Still, analysts indicated they would prefer an acquisition that adds to earnings per share as well as to cash flow. In addition, most analysts indicated they would continue to use P/E multiples in valuing companies in a competitive market. Quite clearly, they expect companies that earn profits on their assets will also be able to grow profits.

2.4 Other Factors Affecting Nuclear Valuation

Many factors affect the value of any enterprise. The financial indicators discussed above are quantitative factors/indicators of financial performance. They are expressed either as a quantity with units (such as dollars or dollars per unit capacity) or as a ratio of quantities. Other factors may be important, but are not amenable to be directly quantified as financial indicators. The qualitative factors affecting the value of a nuclear power plant or company are identified in the following paragraphs. Some of them were identified by responses to the Wall Street survey, others by members of the nuclear power industry community. Each of them could be the subject

of a report or published paper. It is not our intent to cover them in detail. Instead, we give a brief description and cite sources of information in the literature.

In our survey, we asked analysts to rate the importance of 12 qualitative factors that will affect nuclear valuation in a competitive market. In Table 2-2, we present the complete list in the order of importance assigned by the responses.

Operating history is viewed as the most important factor because a strong operating history indicates that management has been capable of running a plant well in the past. The assumption is that management can continue to run a plant well in the future. Analysts acknowledged that a multi-unit owner has the potential to benefit from economies of scale and sharing of information and personnel. As is well known, single unit/plant owners have more operating risks than owners who can rely upon a larger fleet of plants.

The issues of legislation and stranded cost received high marks because of the potential adverse burdens a stakeholder may bear if stranded cost recovery is not permitted. Analysts also considered the company's relations with the NRC and its performance indices to be crucial in evaluating nuclear plants/companies. Strong NRC indices indicate that the plant is in compliance with safety regulations, so that additional resources are not needed to bring the plant into compliance.

Plant location was also mentioned as an important factor to review in assessing value of a nuclear plant/company. In a competitive market, analysts will consider whether a plant/company is based in a regional market—where capacity and transmission constraints and, therefore, electricity prices are high—and whether a plant can capture an advantage attributable to its location. The effect of plant location on value is further discussed later in this section. Interestingly, environmental issues such as emissions allowances and waste disposal were not commonly mentioned as other important factors in a competitive market. A possible reason for this is that analysts rely upon the NRC and other regulatory agencies to monitor these issues.

Lastly, the issues of on-site personnel and reactor type received low marks by analysts. This is perhaps due to the fact that analysts will defer to management in these areas, believing that if the operating and NRC issues are in good standing, the personnel and equipment issues will follow suit.

Table 2-2
Qualitative Factors Affecting Nuclear Valuation

Factor	Rank as Per Response From Survey
Operating History of the Plant	1
Number of Operating Units	2
Status of Legislation in State	3
Stranded Cost Recovery	4
NRC Relations	5
Location of Plants	6
Nuclear Fuel Advantage	7
Decommissioning	8
License Renewal	9
Environmental Issues	10
On-Site Personnel	11
Reactor Type	12

Source: EPRI Survey of Financial Analysts

In the following paragraphs, we briefly discuss selected qualitative factors that influence analysts' valuations.

Nuclear Fuel Advantage With competition in generation, nuclear companies/plants have the potential to be valued high because of stronger profit margins, according to 50% of the analysts polled. Analysts mentioned that nuclear facilities could have a competitive advantage due to low relative fuel costs, particularly in times of high gas and coal prices. In addition, analysts stated that the baseload nature of nuclear facilities becomes more valuable in an environment where electricity prices are high.

Stranded Cost Recovery Predictably, as discussed in the introduction of this chapter, one of the most significant issues for analysts in the current transition environment is the status of legislation on stranded cost recovery. This issue is a qualitative factor of utmost importance to the investment community and how it perceives the value of companies and nuclear facilities. If balanced legislation that provides for stranded cost recovery is in place, the investment community can look forward to ascertain how a company will perform in a competitive market. While the definition of stranded costs is subjective and the method of calculation can vary, Wall Street considers the recovery of these costs to be an important factor in determining a plant's competitive position in a deregulated generation market. The investment community expects to see a balanced resolution of this issue because it affects the financial health of the company.

Without stranded cost recovery, analysts would expect the company to write down its assets in the amount of the value of the stranded cost. An unfavorable ruling could cripple the balance sheet of a nuclear owning company.

Plant Location At least three aspects of the plant location factor impact nuclear valuation—supply/demand, transmission constraints, and regional cost index. To address this effect in our survey, we asked analysts to indicate how important the location of the plant was in evaluating a nuclear plant/company. We had a wide range of responses, from those indicating that it was very important (e.g., what region the plant was located in) to only somewhat important. Most analysts, however, agreed that plant location was important for future determination of value.

Supply/Demand Macroeconomic factors of supply and demand affect the investment community's perception of value of a company/plant. With reserve margins declining in many North American Energy Reliability Council (NERC) regions and with others forecasting scenarios of oversupply over the course of the next few years, we reviewed the importance of supply and demand for electricity and how it might impact the proposed financial indicators for the nuclear industry. Analysts are cognizant of supply constraints and are willing to assign a higher value to low-cost assets that operate well in a competitive market.

To identify companies with assets in supply-constrained areas or strong energy demand areas, Wall Street relies on electricity forward price curves and company management. Commonly used independent sources for demand-side data include other organizations' publications and forecasts published by the North American Energy Reliability Council (NERC) and the U.S. Department of Energy (DOE). NERC expects that U.S. electricity demand will grow 1.4% between 1998-2020 (4). This forecast is based on a 2.2% GDP growth.

The DOE projects that 300 GW of additional new capacity will be required to meet demand by 2020. Of the 132 GW of new capacity needed after 2010, about 21% of it will be constructed to replace retired nuclear facilities (4). In areas of supply constraints, strong demand growth, and high electricity prices, analysts may view companies that own well-run nuclear assets as more valuable than others because of the low production cost and baseload nature. Alternatively, if overcapacity exists, the value of a baseload nuclear generator would likely decline, albeit possibly less than other intermediate or peaking generators.

Transmission Constraints Another aspect of the plant location factor that affects the valuation is whether or not the plant is located in a transmission-constrained area. The output of the nuclear facility must be moveable over high-voltage transmission lines within the state as well as possibly another wheel away in order to complete the financial transaction.

The California supply shortages in the summer of 2000 provide a case study of how the equity market is starting to differentiate between companies that own assets in supply-constrained areas. The stock prices of the six companies in Table 2-3 appreciated from March through September 2000. This is due to the fact that they own generation facilities in California that were benefiting from the high electricity prices in the California Independent System Operator (ISO) during the months of July and August. While the Dow Jones Utility Index continued to rise from September to November, stock prices for these companies fell.

The stock market is now anticipating a more normal earnings stream from the California-based assets as well as a more defensive equity market environment. In the future competitive generation era, capital markets will likely differentiate between areas where electricity prices are high and supply is tight and those where electricity prices are low and supply is plentiful. Clearly, plant location can be an important qualitative factor for analysts to consider.

Table 2-3
Stock Price Changes of Selected Companies with California-Based Generation Facilities, March 2000 to November 2000

	Stock Price ($)		
Company	**Mar**	**Sep**	**Nov**
AES (AES)	$42	$70	$58
Calpine Corporation (CPN)	25	49	38
Duke Energy (DUK)	48	88	85
Dynegy (DYN)	25	65	55
NRG Energy (NRG) (a)	17	36	28
Reliant Energy (REI)	23	40	45
Dow Jones Utility Index	250	340	375

Source: Yahoo Finance Website
(a) NRG Energy was listed for May 2000. March data is not applicable.

Regional Cost Index The cost of doing business differs from region to region in the United States. This cost includes, for example, labor rates, materials cost, and the cost of services, all of which have a significant effect on O&M cost. This effect can be quantified by published regional cost indices such as Means Cost Data (5). For valuation by Wall Street analysts, regional cost can be viewed as being captured by the financial indicator of O&M cost.

License Renewal The process of license renewal extends the term of a plant's licensed operating term, typically from 40 to 60 years. The NRC license renewal process is in place (6,7) and all nuclear plants are expected to eventually take advantage of it. Our analyst survey points to the fact that the issue of renewal is not among the top issues for the investment community today. One reason for this is because the process is newly approved—there have been only two license renewals to date. Furthermore, although the extension of the plant operating term is valuable, the impact on the company earnings and cash flow is too many years in the future for the market to acknowledge at this time, especially for newer plants. As the generation market opens to competition and stranded costs issues are resolved, the Wall Street community will increasingly look to the area of license renewal as another source of value for nuclear owners.

Environmental Credit For decades, the value of clean generation to generating plants and to the world environment has been recognized by the trading of emissions credits among fossil-fueled plants. Spurred by the Kyoto protocol, the electricity industry, through such organizations as the Edison Electric Institute and NEI, is making progress toward having emissions credits for clean air compliance extended to non-polluting nuclear energy (9). Further information on the design of effective emission trading programs is described in EPRI report TR-104245, July 1994, Key Issues in the Design of NO_x Emission Trading Programs to Reduce Ground-Level Ozone (10).

Interestingly, analysts suggested that incremental value for clean air compliance is not yet fully appreciated by Wall Street, despite the fact that 60 out of 103 operating nuclear plants (or 58%) are located in deregulated states. As the market evolves and more regulated assets become deregulated, analysts may assign more value to emissions credits.

Operating Risks Not surprisingly, the investment community views nuclear plants and nuclear generation companies differently from other generation companies in the areas of operating and financial risk. Prior to restructuring, cost recovery issues, safety, and operating performance were important to nuclear asset analysis. In today's transition environment, many analysts mentioned that they are still concerned about the operating risks for nuclear power, including waste storage, warming of cooling water sources, unanticipated aging-related plant degradation, the small possibility of catastrophic accidents, nuclear proliferation, and some measure of negative public opinion. Operating risks were of particular concern, given the potential impact to the level and stability of cash flow and earnings, particularly in the event of an unplanned outage as well as an extended shutdown. The investment community highlighted the fact that nuclear companies could have higher than anticipated capital expenditures and purchased power expenditures because of operational risks. Other issues include regulatory risk, company size in terms of assets, and financial health/credit quality. In general, all these areas of operating risks appear to be amenable to quantifying with a financial indicator. Nevertheless, with some study it may be possible to formulate financial indicators for some of them.

About 40% of the respondents mentioned that nuclear generators should be valued at a discount to other types of generators due to regulatory and operating risk. Many analysts mentioned that growth opportunities for nuclear expansion may not be as buoyant as for gas-fired facilities, and that the nuclear owners may need to find methods to increase their earnings growth outside of nuclear generation. Other analysts mentioned that nuclear companies could gain greater acceptance over time, if they run the facilities productively at low cost. Analysts want nuclear owners to have large balance sheets capable of meeting unanticipated capital requirements.

2.5 Comparison With Other Capital-Intensive Industries

For comparison, our financial consultant selected two other safety-regulated and capital-intensive industries to study the financial performance indicators used by Wall Street analysts.

Airlines We discovered that the airline industry provided a useful comparison because of its similarities to the electric industry. An airline has significant fixed operating costs, similar to an electric utility. For airlines, profitability is closely linked to economic growth, as it is for electric power consumption. The airline industry is capital intensive and the companies tend to have

relatively high debt to equity ratios. The airline industry average debt to equity ratio is 78%, approximately the same level of the electric utility industry. In addition, airline profitability is highly operationally leveraged and is sensitive to changes in fuel prices. Lastly, safety is of concern in both industries. The financial performance indicators that the investment community uses to review airline results are listed in Table 2-4.

Table 2-4
Airline Financial Performance Indicators Used by Wall Street

Factor	Definition
ASSET UTILIZATION / OPERATIONAL	
Yield	Average fare per mile
Unit Revenue	Average fare on flight
Utilization	Measured in hours per day for use of fleet
Load Factor	Passenger revenue to capacity
VALUATION	
P/E	Stock Price/Earnings Per Share
PCF	Stock Price/Cash Flow Per Share (Cash Flow = Net income + depreciation)
Enterprise Value/EBITDA	Net debt + Market Capitalization/ EBITDA

Source: *Merrill Lynch* (12)

Telecommunications The second industry explored, the telecommunications industry, is less comparable to the nuclear industry today, because it has restructured along business lines, long distance carriers, regional bell operating companies, cellular providers, and competitive local exchanges. Since the 1984 breakup of AT&T, technology has created new sectors within telecommunications. Consolidation has brought certain parts of the business back together and combined new players into multi-service companies. There are several important differences between the telecommunications industry and electric industry that make telecommunications-specific indicators less applicable. The first difference is that rapid technological change has reduced operating costs and prices and enhances the types of services offered. Second, unlike airlines and the electric industry, there is no significant variable such as fuel that affects the cost of service for telecommunications. Lastly, analysts utilize valuation and operational indicators to examine the industry, but asset utilization is not measured at all in telecommunications. Rather, operational indicators quantify market share and potential revenue growth.

Through comparison of the nuclear/electric industry to the airline and telecommunications industries in Table 2-5, we confirmed the validity of the use of cash flow valuation indicators as well as asset utilization and production cost indicators. We learned that as an industry

deregulates and consolidates, the use of company assets to earn a return on capital becomes more important for measuring performance and value for Wall Street analysts—whether the issue of asset utilization is a strong driver of value, or in the case of telecommunications, market penetration is a better measure. The investment community will look to the cash flow and earnings a company generates from its assets.

Table 2-5
Comparison of Financial Performance Indicators and Industry Characteristics

Measure	**Electric**	**Airlines**	**Telecommunications**
Valuation/Financial			
P/E	Widely used	Widely used	Used if companies are profitable
EBITDA	Likely to be used more with competition	Widely used	Widely used
Discounted Cash Flow	Likely to be used more with competition	Not widely used	Not widely used because of the subjective factors—terminal value is a significant percentage of the full value.
Internal Rate of Return (IRR)	Likely to be used more with competition. However, shareholders look to earnings accretion. Companies use to determine whether to proceed with a project or not.	Not widely used	Shareholders look to earnings accretion. Companies may look at acquisitions using IRR.
Debt/Equity and Capitalization	Primarily investment grade	Highly leveraged	Ranges from investment grade to junk
Access to Capital	Highly important. Affects valuation and growth prospects.	Important	Highly important. Affects valuation and growth prospects.
Revenue Growth	Likely to be used more with competition	Not widely used	Widely used
Capacity utilization indicators	Widely used	Widely used	Not used as frequently as in the past
Industry Characteristics			
Regulation	Transition to competition in generation. About 60% of installed capacity is competitive today.	Monopoly status removed. Regulation for safety.	Monopoly status removed. Regulation for access to local networks.
Consolidation	Consolidation commenced	Consolidation advanced	Consolidation advanced
Fuel	Will be important in future for profitability as fuel clauses are abolished.	Profitability is highly leveraged to fuel prices.	Not applicable
Capital Intensive	Highly capital intensive	Highly capital intensive	Highly capital intensive
Safety	Very important	Very important	Not applicable

Source*: Merrill Lynch* (12*)* and *Morgan Stanley* (13)

3
NUCLEAR OWNER PERSPECTIVES

3.1 Duke Energy Financial Indicators

In this section, we first present the financial indicators used by a representative nuclear owner, Duke Energy. We next compare the Duke indicators with performance indicators used by several other nuclear owners to establish a list of proposed financial indicators from the nuclear owner perspectives.

Electric generation is evolving to a commodity-based business, or stated simply, generators can only differentiate their products through price and availability. In a competitive, market-driven industry, the successful, long-term operation of a nuclear plant needs to be viewed both as an independent business enterprise and as a valuable element of its corporate owner's portfolio of assets. From Duke Energy's planning viewpoint, this defines three fundamental objectives for nuclear generators:

1) Nuclear Safety, Regulatory Compliance, and Plant Performance
2) Production
3) Competitive Positioning

Displayed in the diagram in Figure 3-1, these three objectives form the cornerstones of the current Duke Nuclear Generation Department Operational Plan.

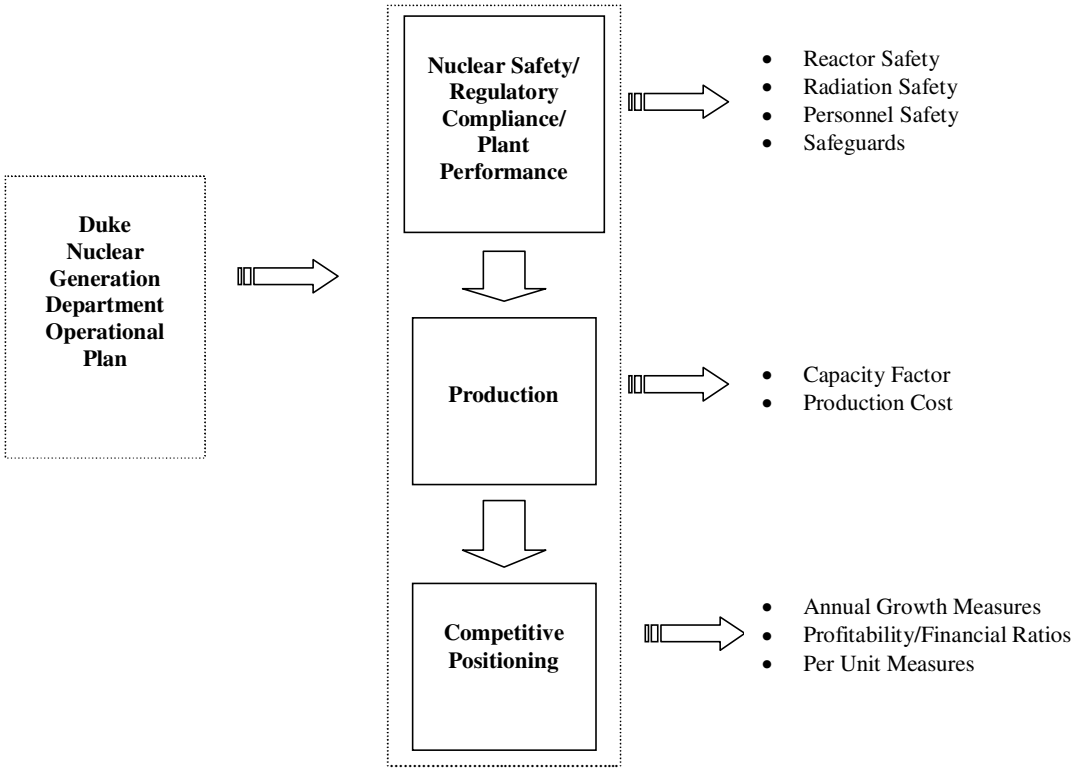

Figure 3-1
Duke Energy Nuclear Generation Operational Plan

Duke Energy indicators for each of the fundamental objectives are used both to measure performance and to set quantified goals for the nuclear portfolio at Duke Energy. These indicators are discussed below.

Nuclear Safety, Regulatory Compliance, and Plant Performance Historically, the role of the NRC has been important to investors and analysts in valuing nuclear companies/plants in the areas of safety and operations. Analysts used the NRC's Watch List and Systematic Assessment of Licensee Performance (SALP) process to monitor problem plants. When a plant was shut down, analysts used the Watch List to follow the progress management would make in returning the unit to service. Analysts would often contact the NRC directly to inquire about the status of problem plants.

The Watch List and SALP process have been abandoned, partly because they were perceived as being too subjective. The NRC has overhauled its regulations and Reactor Oversight Process (ROP) to focus on more objective indicators related to safety issues. In the past, the NRC oversight relied primarily on analyzing inspection findings. The new ROP process monitors nuclear plant performance in the areas of reactor safety, radiation safety, and plant security. With this reform, the NRC bases its oversight not only on inspection, but also on 18 performance indicators in seven areas. (These indicators are identified later in this section under the heading "NRC Performance Indicators"). Table 3-1 provides NEI's view of how the new process compares with the old.

Table 3-1
NRC Nuclear Plant Assessment—Old and New Processes

Nuclear Plant Assessment	
Old Process	**New Process**
Subjective valuation criteria	Objective quantitative performance indicators
No firm safety threshold	Clear, quantitative safety threshold
Lagging indicators (Watch List)	Real-time indicators of plant performance
Evaluation criteria, methods invisible	Evaluation criteria, methods transparent
No clear thresholds for licensee and regulatory action	Actionable thresholds for licensee, regulatory action

Source: *Nuclear Energy Institute* (11)

What are the implications of the new NRC assessment process for financial indicators for the investment community? Analysts noted that the NRC is improving its processes to respond to the new market environment. The increased transparency of processes will likely increase investor/analyst confidence in their ability to gauge a plant's relationship with the NRC. Analysts will devalue a company that is not in good standing with the NRC.

Nuclear safety is a company and industry imperative. Although not financial per se, its indicators form the foundation for all financial indicators, and for this reason we list them among financial indicators. Extended regulatory shutdowns in the future will clearly cripple a generation company's ability to sustain itself.

The indicators of nuclear safety, regulatory compliance, and plant performance are elaborated upon below under the NRC Performance Indicators and in the INPO Performance Indicator Index.

NRC Performance Indicators (2)

The NRC has developed a process for assessing a licensee's safety performance. The process uses risk-informed insights to focus on matters of safety significance. The objective is to monitor performance in three broad areas—1) reactor safety (avoiding accidents and reducing the consequences of accidents if they occur); 2) radiation safety for plant workers and the public during routine operations; and 3) protection of the plant against sabotage or other security threats. As indicated in Figure 3-2, these broad areas are divided into cornerstones—initiating events, mitigating systems, barrier integrity, emergency preparedness, public radiation safety, occupational radiation safety, and physical protection.

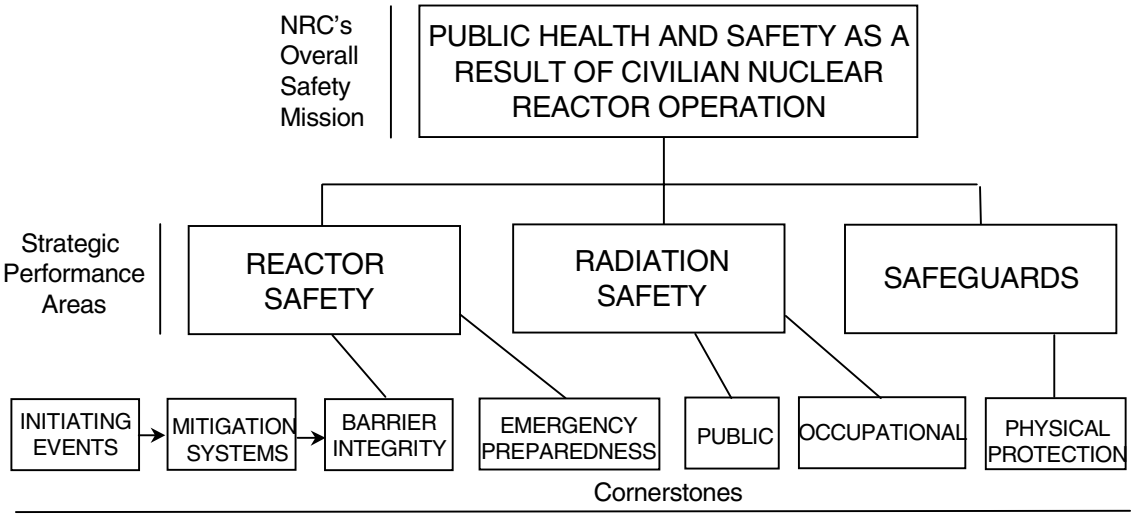

Figure 3-2
Regulatory Oversight Framework

The following indicators flow from the regulatory oversight framework in Figure 3-2 (2).

Initiating Events Cornerstone—Minimize events that could lead to an accident

- Unplanned reactor shutdowns per 7000 critical hours (automatic and manual)
- Unplanned reactor shutdowns with loss of normal heat removal
- Unplanned power changes per 7000 critical hours

Mitigation Systems Cornerstone—Ensure the ability of safety systems to respond to and lessen the severity of an accident

- Safety system unavailability
- Safety system functional failures

Barrier Integrity Cornerstone—Maintain barriers to the release of radioactivity in an accident

- Reactor coolant system (RCS) activity
- RCS leakage
- Containment leakage

Emergency Preparedness Cornerstone—Plans by the utility and governmental agencies to shelter or evacuate people in the community in the event of a severe accident

- Emergency Response Organization (ERO) drill/exercise performance
- ERO drill participation
- Alert and Notification System Performance

Radiation Safety

Public Radiation Safety Cornerstone—Provide adequate protection during routine operations

- Radiological Effluent Technical Specification (RETS)/Offsite Dose Calculation Manual (ODCM) radiological effluent occurrence

Occupational Radiation Safety Cornerstone—Minimize exposure during routine operations

- Occupational exposure control effectiveness

Security

Physical Protection Cornerstone—Physical protection of plant and nuclear fuel

- Protected Area Security Equipment Performance Index
- Personnel Screening Program Performance
- Fitness for duty (FFD)/Personnel Reliability Program Performance

INPO (WANO) Performance Indicators (1)

Unit Capability Factor

- Monitor the reliability of individual unit and industry energy production.
- Provides overall indication of how well plants are operated and maintained.

Unplanned Capability Loss Factor

- Monitor progress towards minimizing outage time and power reductions resulting from unplanned equipment failures or other conditions under plant management control.
- Provides indication of the effectiveness of plant programs and practices in keeping systems available.

Unplanned Automatic Scrams per 7000 Hours Critical

- Monitor unplanned automatic reactor shutdowns.
- Provides an indication of improved plant safety by reducing thermal-hydraulic and reactivity transients requiring reactor scrams.

Safety System Performance Indicator

- Monitor the readiness of important safety systems to respond to off-normal events or accidents.
- Safety system performance monitoring can help reduce core damage probability and the likelihood of significant events.

Fuel Reliability Indicator

Monitor fuel integrity

- Failed fuel is a breach in the initial design barrier to prevent off-site release of fission products.
- Failed fuel has a detrimental effect on operating cost.
- Failed fuel increases radiological hazards to plant workers.

Thermal Performance Indicator (Thermal performance will be dropped from the index this year.)

- Monitor thermal efficiency.
- Provides insight into operation and maintenance of balance-of-plant systems.

Chemistry Performance Indicator

- Monitors the effectiveness of system chemistry based on concentrations of impurities and corrosion products that can adversely affect plant systems and equipment—including sodium, chlorides, sulfates, iron, copper, and dissolved oxygen.

Collective Radiation Exposure

- Monitor efforts to minimize total radiation exposure at each plant and in the industry as a whole.
- Indicates the effectiveness of radiological protection programs in minimizing radiation exposure to plant workers.

Industrial Safety Accident Rate

- Monitor progress in improving industrial safety performance for utility personnel permanently assigned to the station.

The INPO Performance Indicator Index is a weighted composite of the INPO plant performance indicators summarized above.

INPO is continuing to work with the industry toward developing an appropriate and effective set of indicators for improving and monitoring operational performance.

Production In a commodity business, maximizing production efficiency allows fixed costs to be spread over a larger number of units thereby lowering the unit cost.

The following are critical success factors for production:

Capacity Factor
Annual net electrical generation at the output breakers in MWh divided by the period hours multiplied by the maximum net dependable capacity (MNDC), expressed as a percent.

Production Cost
Total production expenses (operations and maintenance costs along with nuclear fuel expenses), as reported in FERC Form 1.

Competitive Positioning This objective complements the production objective. To ensure that reasonable returns can be achieved, costs must be carefully managed in order to produce the lowest reasonable unit cost for products.

Pro forma financial statements are the most widely used vehicles for financial forecasting. A pro forma statement is simply a prediction of what the company financial statements will look like at the end of the forecast period.

Pro forma financial statements have been created for Duke Nuclear. Duke analyzes these financial statements for the nuclear portfolio (seven total units) as well as at the individual plant level (Catawba, McGuire, and Oconee). Areas analyzed include annual growth indicators, profitability/financial ratios, and per unit indicators.

Annual Growth Measures

- Growth in Earnings Before Interest and Taxes (EBIT)
- Growth in Earnings for Common Stock

Profitability/Financial Ratios

- Return on Capital Employed
- Operating Margin
- Profit Margin
- Return on Equity

Per Unit Measures

- Projected Generation (MWh)
- Non-Fuel O&M Cost ($/MWh)
- Production Cost ($/MWh)

Financial statement analysis is useful both to help anticipate future conditions and, more important, as a starting point for planning actions that will affect the future course of events. The pro forma statement is a tool to help management understand the full cost of operating the nuclear business unit.

Profitability is the key for the nuclear enterprise on a going-forward basis. Profitability is the net result of a number of policies and decisions. Profitability/financial ratios show the combined effects of liquidity, asset management, and debt on operating results.

The financial indicators described above are designed to help evaluate a financial statement as well as the firm's overall performance. These indicators are designed to reveal the relative strengths and weaknesses of a company as compared with other companies in the same industry, and to show whether its financial position has been improving or declining over time.

It is important to analyze trends in these ratios as well as their absolute levels, for trends give clues as to whether the financial situation is likely to improve or decline. To perform a trend analysis, an analyst simply plots an indicator over time.

Duke Energy suggests that nuclear asset managers throughout the industry can use the above indicators to help analyze, control, and improve their firms' operations.

3.2 Comparison with Other Owners' Financial Indicators

To broaden the study from a Duke Energy view to a more general nuclear owner view, NAMUG members were requested to provide their lists of nuclear plant performance indicators. Indicators from five members were received. As expected, the plant performance indicators took various forms. Some were long lists, similar in scope to the NEI/EUCG performance indicators in the Standard Nuclear Performance Model (SNPM) (3). The utility lists contained financial as well as plant performance indicators. Some utilities categorized indicators into three or more levels.

From the longer lists provided, we selected candidates for proposed financial indicators and present them in Table 3-2 along with the Duke financial indicators. The selected indicators represent the higher level financial indicators among the members surveyed. Those not selected were viewed as more detailed plant performance indicators that affect value and profitability at a lower level. While some of the indicators in Table 3-2 such as capacity factor are plant performance indicators, by their nature they have substantial effects on financial health in a competitive industry.

To ensure that these indicators are consistent with NEI/EUCG indicators, we compared the two. The three NEI/EUCG overall business indicators—capacity factor, WANO Performance Index, and production cost—are included in Table 3-2. (The WANO index is essentially the same as the INPO Performance Indicator Index.) Other lower level NEI/EUCG indicators—such as outage duration, capital costs, and forced outage rate—also appear in the table. The present study was intended to extend the SNPM performance indicator scope to both Wall Street and corporate levels.

Table 3-2
Comparison of Indicators Used by Several Nuclear Owners

A	B	C	D	E	F
NRC Perf Indicators	NRC Perf Indicators	NRC Perf Indicators	NRC Perf Indicators	NRC Perf Indicators	NRC Perf Indicators
INPO Perf Indicators	INPO Perf Indicators	INPO Perf Indicators	INPO Perf Indicators	INPO Perf Indicators	INPO Perf Indicators
	Going Forward Cost		Going-Forward costs		Going Forward Cost
Capacity Factor	Capacity Factor	Capacity Factor	Capacity Factor	Capacity Factor	Capability Factor
	Peak Period Capacity Factor	Prime Time Availability Factor		Peak Period Capacity Factor	
				Operating Capacity Factor	
Production Cost	Operating Budget - Production O&M	Nuc Production Cost	Meet or Beat Budget	Annual Station Production Cost	Production unit energy cost
Non-Fuel O&M Budget		O&M Spending	O&M in cents/KWH	Station O&M Performance	OM&A
Projected Generation	Net Generation	Station Generation	Net Generation	Net Generation	Net Electrical Production
Effective Full Power Days					
Capital Budget	Operating Budget - Capital	Nuc Capital - Projects Spending	Meet or Beat Budget	Station Capital Performance	Capital Expenditures
	Improvement Initiatives - Capital	Nuc Capital - Fuel Spending			
Rtn on Capital Employed					
		Nuc BusBar Cost	BusBar Costs		
		Total Spending			
Operating Margin					
Profit Margin					
Return on Equity					
Growth in EBIT					
Growth in Earnings for Common Stock					
	Improvement Initiatives - Expense				
	Outage Cost				Planned Outage Budget Index
	Overtime & Overtime Rate	Overtime			
		Supply Group SVA			
		Cost of Nuclear Fuel		Nuc Fuel Expense	
		Num of Vehicles On-Site			
System Inventory Level					
				Station Incremental Cost	
				Net Plant Heat Rate	
				Staffing Levels	Staff Numbers

4
INTEGRATION OF WALL STREET AND OWNER PERSPECTIVES

In this section we consolidate the Wall Street perspective from Section 2 and the nuclear owner perspectives from Section 3 to establish a list of proposed financial indicators.

4.1 Proposed Indicators from Owner Perspectives

From nuclear owner perspectives, the following financial indicators are proposed for used on a going-forward basis, both to measure financial performance and to set quantified goals for the nuclear portfolio.

- NRC Performance Indicators
- INPO Performance Indicators
- Capacity Factor[1]
- Production Cost
- Capital Budget
- Return on Capital Employed
- Busbar Cost
- Operating Margin
- Profit Margin
- Return on Equity
- Growth in EBIT
- Growth in Earnings for Common Stock

This listing was developed by eliminating some of the candidate financial indicators in Table 3-2. Candidates were eliminated either because they were viewed as lower level financial or plant performance indicators, or because they can be easily derived from other indicators (e.g., net generation in MWh is simply capacity factor times rated capacity in MW times one year in hours).

[1] As financial indicators evolve, the more detailed indicator of Peak-Period Capacity Factor might be added to this list.

4.2 Integration of Wall Street/Nuclear Owners' Proposed Indicators

We now categorize and consolidate the nuclear owner list in Section 4.1 with the Wall Street indicators discussed in Section 3. The resulting proposed indicators are shown in Table 4-1, along with a brief definition and explanation of the aspect of asset management that each indicator measures. Each of the categories is discussed further in the following paragraphs.

Valuation Indicators For the valuation category of financial indicators, we are proposing that the nuclear industry and Wall Street adopt P/E, NPV, IRR, Price/EBIT or Firm Value/EBIT, and Price/EBITDA or Firm Value/EBITDA as financial indicators. These indicators apply to both plants and companies. The investment community will use the prospective P/E multiple to measure the value of a nuclear owning company, and may also review the company historical P/E values/ranges. The investment community is likely to use DCF methods to calculate NPV of a project when a company acquires a nuclear plant. Such methods measure how much additional value the plant will add to the total company over the life of the asset as well as how much it will add to earnings in the next year. The return on equity invested will be measured via an IRR analysis. When information is not sufficient to use DCF to calculate an NPV or IRR, analysts may use a P/E, Price/EBIT, Firm Value/EBIT, Price/EBITDA, or Firm Value/EBITDA as indicators for plant acquisitions. They may also use these indicators to determine the value of a company.

Profitability/Integrated Financial Ratios We propose that the following ratios be employed by the industry to measure performance—return on equity (ROE), return on assets (ROA), and operating and profit margins. Analysts will review historical information to evaluate how much return the company/plant is achieving on its equity and assets. They will use the operating and profit margins to monitor the progress a company makes in reducing operating and other costs.

A nuclear company/plant can report its historical and most recently achieved (i.e., last quarter, previous years) EBIT and EBITDA values. In a competitive market, analysts will look at these indicators to determine how well a plant/company is performing and what its impact might be on the parent company. Analysts will forecast the company/plant EBIT and EBITDA for several years into the future. With the reported results of EBIT and EBITDA, analysts can better monitor the progress and profitability of the nuclear company/plant. The majority of the analysts surveyed indicated that it would be helpful to their analysis for the companies to report their plant EBIT and EBITDA in some form—whether it is based on EBIT per MW or another form.

Lastly, analysts will monitor the debt levels of a company and plant. The analysts will look at debt/equity ratios to understand a company's debt levels.

Asset Utilization/Productivity Indicators For the asset utilization/productivity category, we propose the use of capacity factor in keeping with convention. The nuclear plant/company should provide this statistic annually. The analyst will then determine average capacity factors and availability over several years—possibly three to five years to evaluate historical performance. It would also be useful to financial analysts for the nuclear plant/company to report its three- and five-year average capacity factors. The analyst could then conclude whether the company/plant posted a good performance and, if so, assess the likelihood of the good performance continuing in the future.

Note that availability—indicated in the Wall Street survey (Table 2-1) as being of increased importance in a market-based industry—is not among the proposed financial indicators in Table 4-1. The reason is that baseload nuclear plants normally operate at maximum power. Therefore, for nuclear plants, the capacity factor indicator is a measure of the same attribute as availability. For other plants dispatched on the basis of demand, availability measures an attribute different from that measured by capacity factor.

Operating Cost Indicators Analysts will utilize the indicators of production cost ($/MWh) and busbar cost ($/MWh) to monitor cost-cutting progress and identify trends of cost reduction. Additionally, standard reporting of these statistics will help analysts understand the potentially low cost structure for nuclear facilities. Companies should consider publishing production cost ($/MWh) and busbar cost ($/MWh) corporate goals for financial analysts. Using these indicators, the investment community will be able to judge management progress.

Financial methods we considered but are not recommending include Economic Value Added (EVA®, a registered trademark of Stern Stewart Inc.) and Shareholder Value Analysis (SVA). We found that some analysts had written extensive research reports regarding the use of EVA and SVA. However, in our survey, we learned that the methods are not widely used in the electric industry or other comparable industries such as telecommunications and airlines.

Table 4-1
Nuclear Power Financial Indicators

Indicators		What they are	What they indicate/measure
VALUATION INDICATORS			
Price/Earnings Multiple (P/E) (1)	C(2)	Price of stock share divided by future earnings per share (usually current price and one-year earnings projection).	What investors are willing to pay per dollar of reported profits or projected growth.
Firm Value/EBIT (or EBITDA)	C	Company's assets less debt divided by earnings.	Potential of a company to use assets to generate earnings.
Net Present Value (NPV)	C,P	Sum of all future cash flows discounted to present day; represents the company, plant, or project value to the owner (over and above the market's required rate of return for an investment of similar riskiness) and the incremental value to an acquiring company. (Analysts view nuclear power as more risky than other forms of generation.)	Discounted Cash Flow is used to calculate NPV, which is the most fundamental measure of value. It is especially applicable to acquisitions of companies or nuclear assets.
Internal Rate of Return (IRR)(3)	C,P	Discount rate for which the present value of a company's or project's expected cash inflows equals the present value of the company's or project's cost; this rate gives an NPV of zero.	For an analyst, IRR measures the return that a company/plant owner achieves from an investment in a plant.
PROFITABILITY / INTEGRATED FINANCIAL RATIOS			
Return on Equity (ROE)	C,P	Net Income / Average Shareholder's Equity	How well a firm utilizes its equity. Should be analyzed over time and across utilities.
Return on Assets (ROA)(5)	C,P	Net Income/Average Total Assets (expressed as a percentage)	How efficiently a firm utilizes its capital. Provides a comprehensive measure of profitability during a given period.
Operating Margin	C,P	Operating Income/Revenues expressed as a percentage	Ability to generate profits normalized with respect to total revenue (measure of company size).
Profit Margin	C,P	Net Income/ Revenues expressed as a percentage	Profits relative to cost of generating electricity.
Future Capital Requirements (4)	C,P	Annual investment needed to run company or operate plant to the end of its licensed term.	For a nuclear plant, investment needed to run to the end of current licensed term or to benefit from an additional 20 years of operation.
Earnings Before Interest and Taxes (EBIT), Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA)	C,P	Earnings Before Interest and Taxes: Earnings Before Interest, Taxes, Depreciation and Amortization	Cash flow indicators will be more relevant in a competitive market than traditional book earnings measures.
Debt-to-Equity Ratio	C	Total value of business debt divided by total value of equity.	Relative indebtedness of a company.

ASSET UTILIZATION / PRODUCTIVITY INDICATOR

Capacity Factor	P	Power produced in a period expressed as a percentage of the maximum power a unit is capable of producing in that period.	Power produced in a period expressed as a percentage of the maximum power a unit is capable of producing in that period.

OPERATING COST INDICATORS

Production Cost ($/MWh)	P	Non-fuel O&M plus fuel cost divided by MWh produced.	Useful for valuation and benchmarking.
Busbar Cost ($/MWh)	P	Cost of producing one kWh of electricity delivered to, but not through, the transmission system; consists of non-fuel O&M cost (including capital cost), fuel cost, depreciation, interest, and administration and general charges (A&G).	Useful for valuation and benchmarking. Provides a more in-depth view of costs than the production cost indicator.

REGULATORY and PERFORMANCE INDICATORS

Nuclear Regulatory Commission (NRC) Performance Indicators (3)	P	Technical parameters reflecting minimization of events that could lead to an accident; ability to mitigate accident severity and release of radioactivity; emergency preparedness; and radiation protection of plant staff /public as well as physical protection of fuel/plant during routine operation.	NRC's assessment of plant's readiness to maintain an acceptable level of public health and safety.
INPO Performance Indicator Index (4)(5)	P	A weighted composite of WANO plant performance indicators.	Plant technical performance (safety and production).

Notes:

(6) In some cases, Price/EBIT (or EBITDA) is used. EBIT is Earnings Before Interest and Taxes; EBITDA is Earnings Before Interest, Taxes, Depreciation and Amortization.

(7) Indicator can be applied to the following: C = company (with nuclear plants, other generation technologies, or both); P = plant (or fleet of plants).

(8) Public information available to Wall Street.

(9) Not generally available to public; can be made available to Wall Street at the discretion of the owner.

(10) For use mainly by *plant* asset managers—other indicators for use by plant/company asset managers (and Wall Street analysts, if data are reported).

5
REFERENCES

(1) INPO Website, www.INPO.org, WANO Performance Indicators for U.S. Plants.

(2) Regulatory Assessment Performance Indicator Guideline, Nuclear Energy Institute, March 2000. NEI 99-02 Revision 0.

(3) A Standard Nuclear Performance Model—The Process Management Approach, Revision 1, NEI/EUCG Task Force Report, December 2000.

(4) Annual Energy Outlook 2000, Energy Information Agency, December 17, 1999.

(5) Electrical, Mechanical, and Building Construction Cost Data, 2001, R.S. Means, Inc., Kingston, MA: 2000.

(6) Calvert Cliffs Nuclear Power Plant License Renewal Application, EPRI TR-111031- CD, 1998.

(7) Oconee Nuclear Station Application for Renewed Operating Licenses, EPRI TR-110030-CD, 1998.

(8) Valuation and Management of Nuclear Assets: Nuclear Options Model (NOM, Version 1.0) and Case Studies, EPRI, Palo Alto, CA: December 1998. TR-107541.

(9) Nuclear Asset and Project Evaluator (NAPE), Beta Version 0.90, August 2001

(10) Meeting Our Clean Air Needs With Emission-Free Generation—The Need for Nuclear Energy, Nuclear Energy Institute, May 1999.

(11) Key Issues in the Design of NO_x Emission Trading Programs to Reduce Ground-Level Ozone, EPRI, Palo Alto, CA: July 1994. TR-104245.

(12) Status Report: Major Nuclear Energy Issues and Trends, Nuclear Energy Institute, October 2000.

(13) Michael Linenberg, “Airline Equity Investments—The Basics,” Merrill Lynch, September 29, 2000.

(14) Todd Scott, "CLECs," Morgan Stanley, November 7, 2000.

(15) Nuclear Power Life Cycle and Asset Management Planning Paper, Rev. 0, EPRI, August 14, 2000 .

(16) Nuclear Plant Life Cycle Management Implementation Guide, EPRI Report TR- 106109, November 1998.

(17) TAG Technical Assessment Guide. EPRI Report TR-100281-R7, Vol. 3, Rev. 7, September 1997.

(18) Weston and Brigham, Managerial Finance, 7th edition, 1981.

(19) Higgens, Robert C., Analysis for Financial Management, Fourth Edition. Robert C Higgins, 1995.

A
WALL STREET ANALYST SURVEY

1.) Which of the following financial and operational indicators do you use currently to evaluate a nuclear plant performance or nuclear company performance? Which of the following do you feel will be important in a competitive generation market in the future? Check all that apply.

	Transitional market	**Competitive market**
Factor	**Historic/Current**	**Future**
a) Capacity factor		
b) Production cost (defined as non-fuel O&M and fuel cost)		
c) Availability		
d) Outages and refueling time		
e) Capital expenditures		
f) Decommissioning funding		
g) Total cost of production (O&M, fuel, depreciation, interest)		
h) Other _____.		

2.) Do you view nuclear owning companies differently than other generation companies? Please explain.

3.) How important are the following factors in evaluating a nuclear company in a competitive market? Please rank in order of importance with 1 being least important and 5 being most important. Please comment where appropriate.

		Rank
a)	Location of plant(s)	____
b)	Operating history	____
c)	NRC performance indices	____
d)	Current plant license term and planned license term (renewal)	____
e)	NRC relations	____
f)	Environmental issues	____
g)	Reactor type/vendor	____
h)	Political climate	____
i)	Number of operating units (single unit versus multi-unit site)	____
j)	Status of legislation and regulation in the state	____
k)	Position for recovery of decommissioning expenses	____
l)	Whether or not recovery of stranded costs is allowed in the state of operation	____
m)	On-site personnel or contracts for labor	____
n)	Other _____.	____

4.) What financial indicators do you utilize to evaluate nuclear plant acquisitions? Do you use DCF, EBIT, EBITDA, IRR, or NPV? How do you expect your use of these indicators to change with competition in generation?

5.) Profitability—Do you use any rough indicators for nuclear profitability, such as Calpine management's guidance of $20,000 of net income per MW or Duke's $75,000 to $100,000 of EBIT per MW to guide your analysis of nuclear plants? Would you find such management guidance useful to your analysis of nuclear plants?

6.) How should well run, low-cost nuclear generation companies be valued in the market relative to other generation companies, today in a transition environment and later in a competitive market environment?

7.) Do you believe that the information that is available through FERC forms, SEC disclosures and management accounts, and the NRC is sufficient to assess a value for nuclear facilities and nuclear generation companies? If the answer is no, what additional information would you appreciate?

8.) Within the last two years, the NRC has changed its processes for oversight of the industry (e.g., abolishing the Watch List). How have the NRC's changes affected your view of how they regulate the industry, and how you will follow nuclear plant developments and nuclear owning companies?

B
LIST OF PARTICIPANTS IN SURVEY

Equity Research Analysts

Elizabeth Parrella	Merrill Lynch
Dan Ford	ABNAMRO
Shelby Tucker	Bank of America Securities
Kyle Rudden	Chase JP Morgan
Jim Von Reismann	Morgan Stanley

Institutional Investors

Robert Becker	Franklin-Templeton Funds
John Kohli	Franklin-Templeton Funds
Steve Wanek	Capital Guardian Group Inc.
Nathan Partain	Duff-Phelps Investment Management
Bern Fleming	American Express Investment Management
Evan Silverstein	SILCAP Investments
David Kiefer	Prudential

Fixed Income Research Analyst

Deborah Grosser	Salomon Smith Barney

Investment Banking

Caren Byrd	Morgan Stanley

Rating Agencies

Kevin Rose	Moodys
Nancy Messer	Standard and Poors

C
GLOSSARY OF NUCLEAR ASSET MANAGEMENT TERMS AND ACRONYMS

The definitions of terms in this glossary either were developed for this report or were taken from existing sources (see citation numbers). A bolded term indicates that its definition appears elsewhere in the glossary.

asset management	process for making resource allocation and risk management decisions at all levels of a business to maximize profitability and value to all stakeholders (14)
availability	percentage of time in a period that a power plant is available to operate if called upon.
benchmarking	management practice to compare a company's products, services, and practices against the toughest competitors or industry leaders, in an effort to learn better approaches and improve performance (15).
busbar cost	cost of producing one kWh of electricity delivered to, but not through, the transmission system; consists of non-fuel O&M cost (including capital cost), fuel cost, depreciation, interest, and administrative & general (A&G) charges.
capacity factor	power produced in a period expressed as a percentage of the maximum power a unit is capable of producing in that period.
debt	an instrument of finance; all debt instruments provide fixed, regular repayments to the lender by the lendeeborrower, regardless of the lendee's borrower's business performance (17).

debt-to-equity ratio	total dollar value of business debt financing divided by the total dollar value of equity financing (16).
decision analysis	a systematic process for making decisions and understanding risk exposure in situations of uncertainty or imperfect information; relies heavily on mathematical tools such as systems analysis and operations research.
decommissioning fund	for a nuclear power plant, a regular, annual set-aside of funds generated from operations, to support the eventual decommissioning of the plant when it is retired.
derated operation	power plant operation at less than its full rated capacity
discount rate	an interest rate, measured as a percentage, used to convert future dollars into present dollars (discounting) and vice versa (interest compounding), according to standard **net present value** formulas (17).
discounted cash flow (DCF)	analysis technique used in business to convert future cash flow estimates to their present (i.e., today's) value, using a **discount rate**. Related to the term **net present value** (17).
earnings	annual revenues minus annual operating expenses (including non-cash expenses such as depreciation and amortization).
earnings before interest and taxes (EBIT)	standard measure of business performance; calculated as annual total **earnings**, before subtracting out tax payments and payments to debt holders. Also known as net operating income (17).
earnings before interest, taxes, depreciation and amortization (EBITDA)	similar to **EBIT**; calculated by subtracting only cash expenses from revenues. Depreciation and amortization are not subtracted out, as in the **EBIT** calculation (17).

environmental credit	for a power plant, the right to generate a standard quantity of air emissions.
equity	financial value of ownership or partial ownership of a company.
FERC Form 1	data collection instrument used by FERC; documents operating information from all electric generators.
firm value	company's assets less debt.
fixed O&M Costs	O&M cost categories that are independent of the amount of energy generated by the plant (14).
forced outage	A power plant outage brought about when something unanticipated breaks down or goes wrong (see **outage**).
forward price	price of a commodity on offer today, at which a buyer can contract for delivery at some specified time in the future. For example, if the forward price of electricity for January 2003 is $75/MWh, a buyer can contract for that price today and be assured of getting electricity at that price on 1/1/2003, regardless of what the "spot" price is on that day.
future capital requirement	an estimate of a power plant's future capital investment needs; an indicator of long-term operating health and cash flow generation potential.
heat rate	amount of heat (measured in BTUs) required to produce a kilowatt-hour of electricity; a measure of power plant efficiency, i.e., a lower heat rate means a more efficient plant (16).
internal rate of return (IRR)	**discount rate** for which the present value of a company's or project's expected cash inflows equals the present value of the company's or project's cost; this rate gives an NPV of zero.

license renewal	formal process undertaken by a nuclear power plant to extend the term of its operating license, typically from 40 to 60 years; the Nuclear Regulatory Commission grants such renewed licenses.
life cycle management (LCM)	process by which nuclear power plants integrate operations, maintenance, engineering, regulatory and business activities to 1) manage plant condition, 2) optimize operating life, and 3) maximize plant value while maintaining plant safety (14).
net asset value	current price of a share of stock.
net present value	present (i.e., discounted) value of the cumulative future net cash flow generated by a company, plant, or project.
nuclear asset management	process for making resource allocation and risk management decisions at all levels of a nuclear generation business to maximize profitability and value to all stakeholders while maintaining plant safety (14).
operating cost	cost of producing one kWh of electricity delivered to, but not through, the transmission system; consists of (fixed and variable) non-fuel O&M cost (including capital cost) and fuel cost only.
operating margin	difference between operating revenue per kWh (i.e., market price) and operating cost per kWh; a measure of how much cash can be generated to retire debt and cover related capital costs.
operating risk	probability that through operations, themselves, conditions can be created that threaten continued operation and cash flow; can include such issues as waste storage uncertainty, equipment breakdown, cooling water degradation, and accidents.

option value	increment in net present value due to the right—not the obligation—to retire a plant before expiration of the original licensed term or to operate during a license renewal term; option value is always positive because an option will be exercised only if future conditions are favorable (14).
outage	for a power plant, a period during which it is offline and not producing electricity.
planned outage	for a power plant, a period during which it is taken offline for performing refueling and planned maintenance (see **outage**).
price/earnings multiples (P/E)	standard family of financial indicators of business performance. The ratio of the stock price (as determined by the market) to earnings as represented by typical accounting measures of income, usually **EBIT** or **EBITDA**. Also known as price/earnings ratios. It is Wall Street's valuation of profitability.
production cost	non-fuel O&M plus fuel cost; used by system dispatchers to rank order production units for daily and incremental use.
productivity	amount of output generated per unit of input. In a power plant **capacity factor** (i.e., MWh generated per unit of MW capacity) is a measure of productivity.
profit margin	difference between revenue per kWh (market price) and total cost per kWh (includes operating costs, debt payments, taxes and other corporate costs); a measure of cash generated for stockholders (17).
pro forma statement	financial statement prepared on the basis of some assumed future events; usually consists of an income statement, balance sheets and cash flow statement (18).
rate base	value of property upon which a utility is given the opportunity to earn a specified rate of return as established by a regulatory authority.

regulatory compliance	power plant operation within the scope of regulatory rules (i.e., EPA environmental regulations, NRC safety regulations).
return on assets (ROA)	**earnings** as a percentage of total assets; ratio of net income to total assets (17).
return on equity (ROE)	**earnings** as a percentage of stockholder equity; ratio of net income to common equity; measures the rate of return on common stockholders' investment (17).
return on rate base	earnings allowed by a regulatory authority expressed as a percentage of the **rate base**.
scheduled outage	see **planned outage**
scram	emergency plant shutdown usually triggered by a safety concern.
spot price	price of a commodity for immediate exchange at a specific point in time.
stranded cost recovery	ability of an electric utility to recover **stranded costs** through surcharges or other means, as allowed by a regulatory authority.
stranded costs	costs incurred in the past that have been rendered non-economic or "stranded" due to the onset of competition or by other changing economic or business conditions.
sunk costs	costs incurred (i.e., funds spent or committed) in the past that cannot be affected by any present or future course of action (16).
thermal performance	amount of fuel energy converted into thermal (heat) energy (which is subsequently converted into electrical energy).
unit capability factor	ratio of available energy generation (energy that could have been produced considering only limitations under plant management control) to reference energy generation.

unplanned capability loss factor (UCLF)	for a nuclear power plant, total off-line time annually caused by factors not under the plant operator's control.
Valuation	process by which the value of an asset or resource is assessed.
variable O&M costs	O&M cost categories that depend at least partially on the amount of energy generated by the plant, excluding fixed costs that are incurred regardless of whether the resource is operating (14).
weighted average cost of capital (WACC)	weighted average (by dollar percentages) of the costs of **debt** and **equity** (preferred stock and common equity) to a firm; a summary measure of the cost of new financing (17)

Glossary of Acronyms

A&G	Administrative & General (categories of expenses)
BTU	British Thermal Unit
DCF	Discounted Cash Flow
DOE	U.S. Department of Energy
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EVA®	Economic Value Added®
EPA	Environmental Protection Agency
ERO	Emergency Response Organization
EUCG	Formerly the Electric Utility Cost Group
FERC	Federal Energy Regulatory Commission
FFD	Fitness For Duty

GDP	Gross Domestic Product
GW	Gigawatt(s)
INPO	Institute of Nuclear Power Operations
ISO	Independent System Operator
IRR	Internal Rate of Return
kWh	Kilowatt-hour(s)
LCM	Life Cycle Management
MNDC	Maximum Net Dependable Capacity
MW	Megawatt(s)
MWh	Megawatt-hour(s)
NAM	Nuclear Asset Management
NAMUG	Nuclear Asset Management Users Group
NAV	Net Asset Value
NEI	Nuclear Energy Institute
NERC	North American Energy Reliability Council
NOM	Nuclear Options Model
NPV	Net Present Value
NRC	U.S. Nuclear Regulatory Commission
O&M	Operations & Maintenance
ODCM	Offsite Dose Calculation Manual
PCF	Price/Cash Flow Per Share
P/E	Price/Earnings Multiple or Ratio
RCS	Reactor Coolant System
RETS	Radiological Effluent Technical Specification

ROA	Return on Assets
ROE	Return on Equity
ROP	Reactor Oversight Process
SALP	Systematic Assessment of Licensee Performance
SEC	Securities and Exchange Commission
SNPM	Standard Nuclear Performance Model
SVA	Shareholder Value Analysis
UCLF	Unplanned Capability Loss Factor
WACC	Weighted Average Cost of Capital
WANO	World Association of Nuclear Operations

Target:
Nuclear Power

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