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Society of Depreciation Professionals

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Society of Depreciation Professionals
Goals and Objectives

Overall Goals

The objectives of the Society shall be to recognize the professional field of depreciation and those individuals contributing to this field; to promote the professional development and professional ethics of those practitioners in the field of depreciation; to collect and exchange information about depreciation engineering and analysis; to provide a national forum of programs and publications concerning depreciation.

Activities

- Provide a forum for discussion of issues relating to depreciation policy.
- Recognize professionalism through membership and awards for service and contributions to the art of depreciation.
- Encourage papers on matters of interest to depreciation professionals.
- Sponsor regular conferences.
- Provide members with information and training that will enhance their skills as depreciation professionals.
- Sanction individually, or jointly with other organizations, educational forums on depreciation.
- Publish a regular newsletter.
- Provide electronic data sources such as internet communication or other electronic data services.

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Appraising a Utility for Condemnation Purposes
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Utility condemnation proceedings typically involve a condemnor intent upon taking over the operation of some portion of the condemnee's business. Therefore, such proceedings involve the partial taking of a business through a transaction in which one of the parties is being forced to participate. Such takings require careful consideration of appraisal techniques to assure that the condemnee and its remaining customers neither gain nor lose as a result of the transaction. This article discusses an appraisal approach that produces this result.

A Retrospective Look at Reserve Ratios
Ralph Bjerke

This article illustrates that the reserve ratios for dispersed properties can be severely understated when calculated using the prospective method.

Local Exchange Carrier Depreciation Reserve Percents
Richard B Lee and Michael J Majoros, Jr

In 1980, the Federal Communications Commission changed its procedures and orientation with respect to the prescription of depreciation rates for telephone companies. This paper examines the effect of these changes on the depreciation reserve percents of local exchange carriers.

The Purpose of Depreciation Accounting
John S Ferguson CDP

The determination of depreciation rates that are consistent with the purpose of depreciation accounting requires a basic understanding of that purpose. The major thrust of this discussion is the purpose applicable to regulated entities, which is specified by a framework of accounting and regulatory principles and regulatory rules. However, the purpose applicable to non-regulated entities, which is specified by accounting principles, is also mentioned.

The effects on utility customers of departing from the framework applicable to regulated entities are illustrated. These effects show that customers benefit from adherence to this framework, so demonstrate the importance of depreciation analysts having a thorough understanding of accounting and regulatory principles and regulatory rules.

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1. Deadline for all abstracts is June 1, 2002
2. All manuscripts will be reviewed by two reviewers.
3. Each manuscript should include an abstract of no more than 150 words.
4. Manuscript should be submitted in MSWord format and forwarded to Journal Committee Chair and Executive Secretary.
5. Author(s) should use standard symbols and the English alphabet.
6. Footnotes should be listed at the end of the manuscript.
7. Each table should be titled at the top, each figure should be titled at the bottom, and each table and figure should be provided on a separate sheet. All tables and figures should be camera ready, with margins that will fit on 8 ½ x 11-page format.
8. Only references cited in the text should be listed. The format for references shall be: Author's last name, author's first name; additional author's last name, additional author's first name; title of article (in quotes), title of book/magazine (bold type or underlined), publisher, volume number and year, event at which paper was presented, city, state, month, day, year.
9. Author is requested to submit a brief biography listing credentials.

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- To serve as a forum for the exchange of information;
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Asset Life Characteristics and the Weibull Distribution

Richard K Ellsworth

Abstract

The Iowa-type survivor curves have historically been relied upon to describe asset life characteristics. This article discusses the Weibull distribution as an alternative survival model to describe asset life characteristics.

The broad asset universe that exists today creates a situation whereby assets exhibit divergent experiences with regard to life characteristics. Asset life is dependent upon factors such as operational use, design specifications as well as the repair and replacement policies. Variations in these factors cause asset mortality experience to follow a variety of behavior patterns. These divergent mortality situations require statistical survivor curve models with the ability to describe a wide variety of retirement patterns.

Historically, the Iowa-type survivor curves have been relied upon to describe asset life characteristics due to their ability to describe many different mortality experiences and their development using a variety of asset types. An additional survivor curve descriptor of asset life characteristics is the Weibull distribution which is also capable of modeling a diverse array of retirement patterns. This article discusses the Weibull distribution and its use as a descriptor asset life characteristics.

History of Survivor Curves

The development of survivor curves is most commonly associated with the insurance industry, where actuaries study human birth and death statistics with the intent of establishing life expectancy for purposes of calculating insurance premiums. The construction of survivor curves for physical assets began with the compilation of data in the early 1900s. Survival analysis is an actuarial study of an asset population to calculate its life characteristics. Survival analysis results in the determination of the average service life and remaining useful life of an asset population. The Iowa-type survivor curves resulted from empirical observation of the retirement experience of a variety of physical assets in the 1920s and 1930s while the Weibull distribution is a two-parameter theoretical survivor model named after Waloddi Weibull who popularized its use as a product life model in the early 1950s.

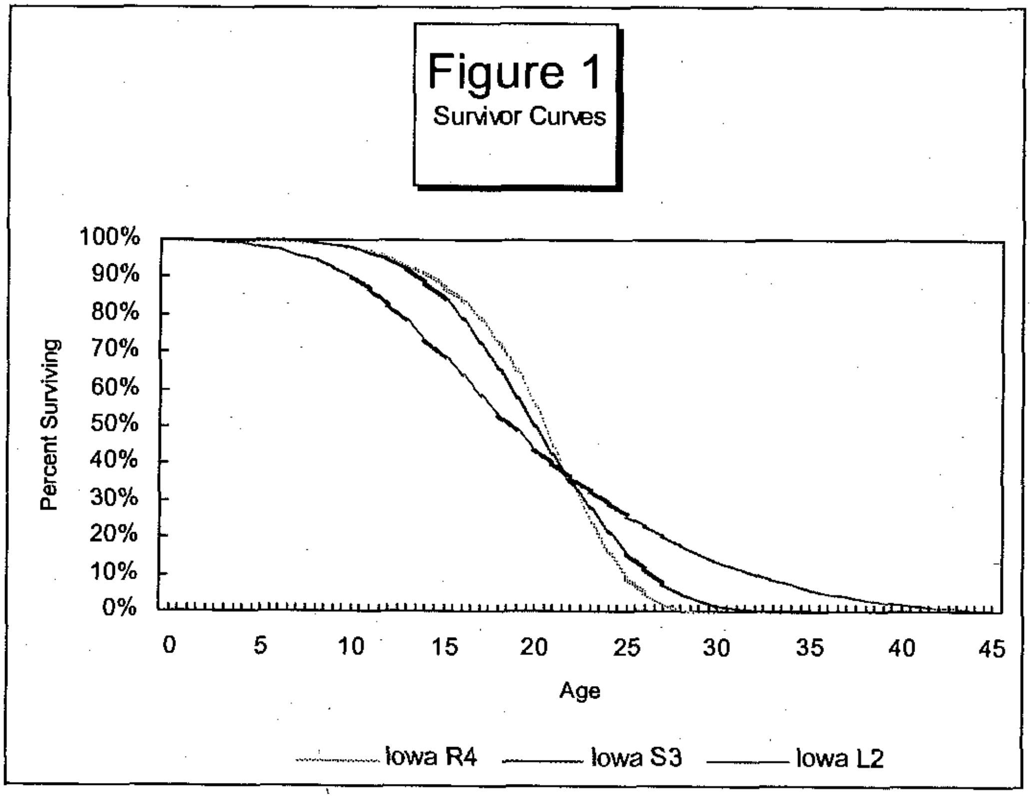
Iowa-Type Survivor Curves

The Iowa-type survivor curves evolved from early valuation work directed by Anson Marston, the Dean of Engineering at Iowa State College. Professor Marston recognized the need for the development of a method to quantify useful life and suggested the concept of a research project to faculty member Edwin B. Kurtz. A formal research project was undertaken by Kurtz in 1921 to expand the data collection for the development of survivor curves that he began as a graduate student at the University of Wisconsin. Robley Winfrey joined Kurtz in his research efforts in 1922. During their research, Kurtz and Winfrey noted that they could group asset types according to generalized patterns when the retirement data was standardized based on useful life. In 1931, Kurtz and Winfrey published the results of their research as Iowa Engineering Experiment Station Bulletin 103 which listed 13 Iowa-type survivor curves generated from 65 sets of property experience.

The Iowa-type survivor curves were standardized by expressing age as a percent of average service life and survivor experience as a percent of the original asset population. Standardization enabled the survivor curves to be generalized and compared regardless of their average service life based upon a common scale, permitting comparison of different retirement data experiences through the plotting of the profiles of the survivor curve and the frequency of retirement curve. Bulletin 103 was the first publication to identify survivor curve types based upon their retirement frequency profile.

Iowa-type survivor curves are specified according to their average life and the shape of their retirement pattern. The L series designates left-moded curves, the S series indicates symmetrical-moded curves, the R series designates right-moded curves and the O series indicates origin-moded curves. A low number for the retirement pattern indicates a wide dispersion pattern while a high number indicates a narrow dispersion pattern. The left-moded curves describe life characteristics whereby the greatest retirement frequency occurs prior to the average service life. The right-moded curves demonstrate their greatest retirement frequency after the average service life has been achieved. With the symmetrical-moded curves the greatest retirement frequency occurs at the average service life. The origin-moded curves experience their greatest retirement frequency in the year of placement in service. A letter (L, S, R or O) specifies each retirement pattern while a number designates the width of the dispersion pattern for the Iowa-type survivor curves.

Figure 1 illustrates the survivorship profiles for Iowa R4, Iowa S3 and Iowa L2 survivor curves with 20-year useful lives.



Further survivor curve research led to the publication in 1935 of Iowa Engineering Experiment Station Bulletin 125 "Statistical Analysis of Industrial Property Retirements" which presented 18 survivor curve types for considering the quantification of useful life. The six left-moded curves describe life characteristics whereby the greatest retirement frequency occurs prior to the average service life. The five right-moded curves exhibit their greatest retirement frequency after the average service life has been achieved. With the seven symmetrical-moded curves the greatest retirement frequency occurs at the average service life. A letter (L, S or R) specified each retirement pattern while a number designated the width of the dispersion pattern for the Iowa survivor curves. In 1967, a revised version of Bulletin 125 was published to include four origin-moded O-type survivor curves where the highest retirement rate occurs in the year of placement.

Statistical studies based on the application of the Iowa-type survivor curves to establish useful life resulted in the identification of nine additional survivor curves. Eight of these additional survivor curves are half curves proposed by engineers at Public Service Electric and Gas Company. Based on experience with the Iowa survivor curves, the Public Service Electric and Gas Company engineers felt that the transition between the low numbered curves was so great that they averaged the successive survivor curve types to define half curves. The ninth additional survivor curve type is the square survivor curve, bringing the total number of Iowa-type survivor curves recognized by utility industry practitioners to 31.

Weibull Distribution Survivor Curves

The Weibull distribution, an additional survival model, has been utilized to describe life characteristics for a variety of applications. The Weibull distribution represents a generalization of the exponential distribution overcoming the constraining assumption of a constant failure rate associated with the exponential distribution. With its ability to model a diverse array of increasing, decreasing and constant failure rates, the Weibull distribution has broad applicability as a survival model.

The Weibull distribution is named after Swedish engineer, Waloddi Weibull, who popularized its use as a product life model in the early 1950s. The Weibull distribution was initially popularized as a model of product failure through Waloddi Weibull's extensive promotion of the distribution as a survival model in numerous journals. The distribution's use has continued to expand beyond engineering to such diverse fields as the biomedical science, appraisal and accounting professions.

The Weibull distribution, a two-parameter survival model, is described mathematically according to the function S(t) = e(-(t/a)^b) with time "t" being greater than zero and where "S(t)" is the survival percentage at age "t", "e" is the exponential function, "a" is the scale parameter and "b" is the shape parameter. The adjustment of shape and scale parameters enables the Weibull distribution to model a wide variety of asset survival patterns.

The Weibull distribution survival function is defined by two parameters: shape and scale. The exponential nature of the Weibull distribution requires a logarithmic transformation of the survival function in order to linearize the survival data. Once the survival data has been linearized, the shape and scale parameters can be determined using traditional linear regression techniques. The availability of linear regression capabilities in spreadsheet software enables the direct estimation of Weibull distribution parameters.

The Weibull distribution permits the direct solution of shape and scale parameters to uniquely describe the asset population survivor curve. The Iowa-type survivor curves require an iterative process to mathematically establishing the best fitting survivor curve. Once the shape and scale parameters are known, the useful life is calculated directly from the shape and scale parameters using the following mathematical relationship:

Useful Life = scale * gamma(1+(1/shape))

where

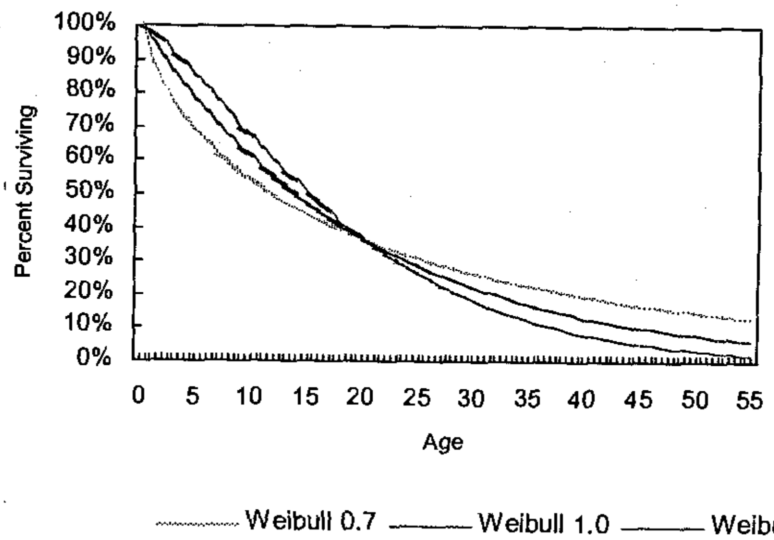
scale = Weibull scale parameter
shape = Weibull shape parameter
gamma = gamma function

The Weibull distribution is capable of modeling asset mortality situations for increasing, decreasing and constant failure rates. Variation of the shape parameter produces a variety of survivor patterns including an increasing failure rate when shape is greater than 1, a decreasing failure rate when shape is less than 1, and a constant failure rate if shape is equal to 1. The Weibull distribution has been used as a survival model to predict the survival rates in engineering and biomedical applications. In the appraisal profession, the Weibull distribution has been used as a descriptor of survival behavior for many assets with its ability to describe many different survival patterns.

Figure 2 illustrates the impact of varying the shape parameter for the Weibull distribution where the scale parameter is equal to 20 and the shape parameter is equal to 0.7, 1.0 and 1.3.

Figure 2

Weibull Distribution Survivor Curves



The Weibull distribution has been used as a survival model to predict the survival rates for engineered products and biomedical applications. The Weibull distribution's ability to describe many different survival patterns has made it popular as a model of life characteristics in a number of industries.

Statistical Determination of Useful Life

The formal study of population statistics with the intent to develop survivor curves that describe life characteristics is most commonly associated with the insurance industry, where actuaries examine human births and deaths to establish life expectancy for the purpose of determining insurance premiums. Physical assets experience a mortality dispersion that is analogous to that of human life expectancy where some assets are retired at an early age while other assets experience an extended service life. The statistical techniques associated with survival analysis correspond to an actuarial study of an asset population to calculate its useful life characteristics.

The useful life developed using survival analysis equates to the period of time over which an asset is reasonably expected to economically perform the function for which it was designed and is mathematically calculated as the area under the survivor curve. Survival analysis results in a determination of useful life giving consideration to equipment specifications as well as maintenance, repair and replacement policies.

The experience with United States passenger automobiles is illustrative of the application of the retirement rate method. The 1998 Ward's Automotive Yearbook contains information pertaining to the number of operating vehicles categorized by model year from which the number of automobiles exposed to retirement and the number of automobiles retired for each age of the population are categorized by vehicle model year. The exposure and retirement information can be tabulated to enable a retirement rate analysis to be performed for the population. Table 1 presents the distribution of retirement exposures and the retirement experience for 1986 vintage automobiles in the United States based on information published in the 1998 Ward's Automotive Yearbook.

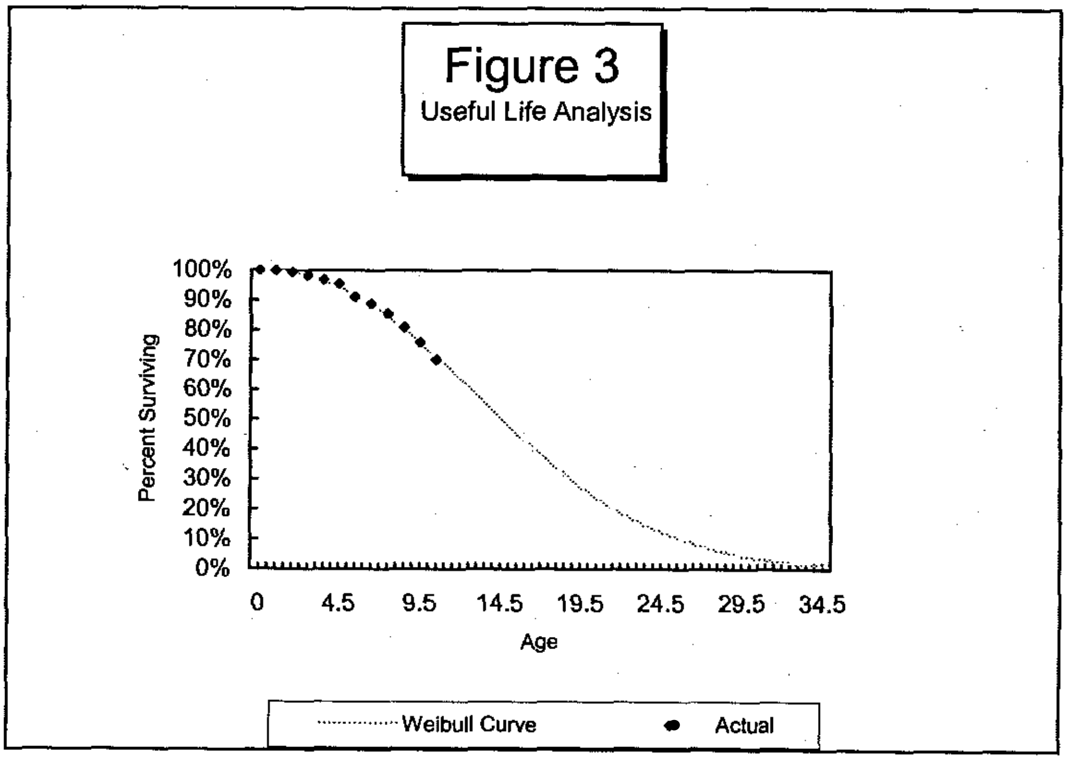
Table 1
Asset Population
Retirement Rate Method

Age	Units Exposed	Units Retired	Retirement Rate
0.5	10,699	5	0.0005
1.5	10,694	59	0.0055
2.5	10,635	146	0.0137
3.5	10,489	123	0.0117
4.5	10,366	152	0.0147
5.5	10,214	462	0.0452
6.5	9,752	251	0.0257
7.5	9,501	367	0.0386
8.5	9,134	469	0.0514
9.5	8,665	531	0.0613
10.5	8,134	630	0.0775

In Table 1, the population age distribution is presented as well as the retirements from each age group. The retirement rate method establishes a retirement pattern based upon the retirement rates observed in the asset population. Dividing the units retired by the units exposed to retirement for each age group produces the individual age group retirement rates. From the individual retirement rates the observed survivor curve for the asset population is constructed as the cumulative product of the survival percentage at each age. The observed survival curve depicts the relationship between age and the expected survival percentage for the asset population.

After the asset population observed survivor curve is constructed, it is compared with survivor curve models using a least squares statistical analysis between the observed survivor curve and the survival curve models. The survival curve model that minimizes the squared differences between the survivor curve model and the observed survivor curve is the best fitting survivor curve model. The average useful life for the asset population is then calculated as the area under the survivor curve.

Statistical analysis of the retirement rate information in Table 1 yields a Weibull distribution with an average life of 15.4 years (shape 2.135 and scale 17.357) as the best fitting survivor curve for the asset population. Figure 3 graphically presents the least squares curve fitting process for the asset population under consideration.



Survival analysis and the corresponding development of a survivor curve to describe asset life characteristics represents a statistical method for establishing useful life. The availability of a complete survivor curve permits the calculation of asset remaining life expectations at any age. Statistical analysis of an asset population thus provides the information necessary to establish asset population useful life characteristics.

Conclusion

Asset useful life is dependent on factors such as asset design specifications, industry specific considerations as well as the operation and maintenance policy applied to the asset. Statistical analysis of historical retirement behavior considers these factors in establishing asset useful life. The implementation of a statistical analysis to establish useful life permits a rational quantitative methodology from which to develop asset useful life.

The Iowa family of survivor curves has traditionally been used to describe asset retirement behavior due to the ability to model varying mortality experiences. With its ability to model a variety of diverse retirement patterns, the Weibull distribution has proven to be capable of modeling retirement characteristics for a wide spectrum of assets. Since the Weibull distribution is such a flexible survival curve model, it is a logical choice for describing asset life characteristics.

The Implications of Recent AICPA and FASB Property Accounting Pronouncements for Regulated Entities

John S Ferguson CDP

Abstract

Two recent accounting pronouncements have the potential for influencing the depreciation accounting of utilities, pipelines, railroads and telecommunication companies (regulated entities). Their impact is due to calling for financial accounting practices that differ from certain aspects of regulatory accounting practices imposed by Uniform Systems of Accounts. This article is similar to but is not identical to my presentation at the 2001 annual meeting of the Society. The major difference is in the discussion of whether cost of removal or net removal cost defines the asset retirement obligations covered by the FASB pronouncement.

On June 29, 2001, the Accounting Standards Executive Committee (AcSEC) of the American Institute of Certified Public Accountants (AICPA) issued an exposure draft of a Proposed Statement of Position (PSOP), *Accounting for Certain Costs and Activities Related to Property, Plant, and Equipment* (PP&E). Concurrent with the PSOP, the Financial Accounting Standards Board (FASB) issued a proposed financial accounting standard, *Accounting in Interim and Annual Financial Statements for Certain Costs and Activities Related to Property, Plant, and Equipment*, that would rescind Statement No. 73, *Reporting a Change in Accounting for Railroad Track Structures* and modify the following existing pronouncements to be consistent with the PSOP:

- Accounting Principles Board (APB) Opinion No. 20, *Accounting Changes*
- APB Opinion No. 28, *Interim Financial Reporting*
- FASB Statement No. 51, *Financial Reporting by Cable Television Companies*
- FASB Statement No. 67, *Accounting for Costs and Initial Rental Operations of Real Estate Projects*

The influence of the PSOP on regulated entities is due primarily to requiring the component concept of depreciation accounting and precluding ratable treatment for cost of removal through depreciation – both inconsistent with regulatory accounting requirements.

Also in June the FASB issued Statement of Financial Accounting Standards No. 143, *Accounting for Asset Retirement Obligations* (SFAS 143). The influence of SFAS 143 is its precluding ratable treatment through depreciation of asset retirement obligations (AROs). In this context, *retirement* refers to a transfer of ownership or to a physical process, not to an accounting process. Therefore, as do Uniform Systems of Accounts (USofAs), an ARO applies whether there is actual removal or merely a process of safe abandonment.

AROs occur either when cost of removal exists or when cost of removal exceeds salvage proceeds, depending upon how SFAS 143 is interpreted. Cost of removal exceeding salvage is referred to herein as *net removal cost*. SFAS 143 requires recording as a liability AROs incurred and satisfied at any time during the life of assets that are imposed by law, statute, ordinance, written or oral contract, or legal construction of a contract under the doctrine of promissory estoppel. All other AROs are to be expensed when incurred.

If SFAS 143 is interpreted to apply when cost of removal exceeds salvage, when the reverse is true (salvage exceeds cost of removal) both would continue to be treated on a ratable basis through depreciation. If SFAS 143 is interpreted to apply only to cost of removal, all salvage would continue to be treated on a ratable basis through depreciation. I will discuss later why there may be more than one interpretation of how salvage is to be treated. The intent of the PSOP is to be consistent with SFAS 143, but is different because it was published prior to SFAS 143 being available. Therefore, this discussion concentrates on the treatment of AROs specified by SFAS 143.

Liability treatment records the initial present value of the ARO as part of the depreciable cost of the asset and as a liability for which future accretion as the discounting unwinds is recorded as *accretion expense*. The present value is based on the credit-adjusted risk-free borrowing cost of the entity at the time the obligation is incurred.

Entities that do not qualify for the special accounting allowed by FASB Statement No. 71, *Accounting for the Effects of Certain Types of Regulation* (SFAS 71), would base financial statements on the PSOP and SFAS 143. Entities that qualify for SFAS 71 would also base financial statements on the PSOP and SFAS 143, but would reflect any differences between the PSOP and SFAS 143 requirements and regulatory accounting practices in income statements as changes to expenses and on balance sheets as regulatory assets or liabilities. When expenses for financial accounting are higher than for regulatory accounting, reported expenses are decreased by the difference and a corresponding regulatory asset is added to the balance sheet. When expenses for financial accounting are less than for regulatory accounting, reported expenses are increased by the difference and a corresponding regulatory liability is added to the balance sheet. In effect, SFAS 71 causes the income statement to reflect the regulatory accounting expenses, with the differences from financial accounting shifted to the balance sheet.

The financial statements of regulated entities tend to not be very specific about the implications of the depreciation practices imposed by regulation. The PSOP and SFAS 143 demonstrate an interest by the AICPA and FASB in these implications being more specifically disclosed in the future.

The extent of the influence of the PSOP and SFAS 143 on regulated entities would depend upon the type of entity, the type of PP&E, the existing regulatory practices, and how individual entities and regulators react to the modified accounting practices. I am convinced that neither the PSOP nor SFAS 143 would improve the reliability of utility, pipeline, railroad and telecommunication company financial statements, and are likely to lead many users of the statements to misinterpret their meaning, unless these entities can find a way to ignore the PSOP and SFAS 143. As is evident from this discussion, I am also convinced that there will be plenty to think about when developing implementation strategies for the PSOP and SFAS 143. The need to periodically test the continued validity of implementation assumptions makes it important to document their bases and the bases of any future changes to these assumptions.

Application

The PSOP and related FASB proposal are to be effective for fiscal years beginning after June 15, 2002, with earlier adoption encouraged, would be utilized for annual and interim financial reporting, and would apply to all non-governmental entities, including not-for-profit organizations and regulated entities. The proposals would not apply to internal-use software covered by SOP 98-1 and to lessors of assets subject to operating leases, and do not address insurance proceeds from casualty losses or other insured damages. Only the component depreciation portion would apply to lessees of assets subject to capital leases. The PSOP has proven to be controversial, which may delay its effective date.

The PSOP defines four stages of PP&E projects – Preliminary, Pre-acquisition, Acquisition or Construction and In-Service – and specifies the appropriate accounting for each stage. This has the effect of shifting decisions as to whether expenditures are to be recorded as capital or expense from being based on the purpose of the expenditures to being based on their timing.

SFAS 143 is effective for fiscal years beginning after June 15, 2002, with earlier adoption encouraged, is to be utilized for annual and interim financial reporting, and applies to all entities, including regulated entities that qualify for SFAS 71. The Standard applies to component parts of large groups of assets for which separate retirement obligations are identifiable, to the assets of a lessee accounted for as a capital lease, and to the assets of a lessor. The Standard applies to AROs resulting from normal operations, but does not apply to costs associated with maintenance rather than retirement, to AROs arising from improper operations, or to AROs arising solely from a plan to dispose of an asset. Costs of replacement parts are not covered, but obligations for the disposal of replaced parts are. SFAS 143 does not address treatment of salvage, or alternatively, treatment when salvage proceeds are expected to exceed cost of removal, because there would be no ARO. An ARO qualifying for liability treatment that is incurred over more than one reporting period is to be treated as separate liabilities. Assets already retired but not yet removed, which commonly occurs for electric generating units, are to be treated in accordance with SFAS 90, *Regulated Enterprises – Accounting for Abandonments and Disallowances of Plant Costs*. Concluding that an ARO requires liability treatment is probably an event that would require the associated asset to be tested for impairment.

The stated objective of the initial liability measurement is fair value, and the FASB recognizes that most entities will base this measurement on the present value of expected future cash flows. Statement of Financial Accounting Concepts No. 7, *Using Cash Flow Information and Present Value in Accounting Measurements* (SFAC 7), states that "expected present value refers to the sum of probability-weighted present values in a range of estimated cash flows, all discounted using the same interest rate convention." Forms of assurance, such as trust funds required by the Nuclear Regulatory Commission (NRC) for decommissioning nuclear facilities, would not be offset against the liabilities. However, forms of funding assurance may decrease risk, so could reduce the applicable discount rate.

Background

The PSOP is in reaction to the AcSEC's observation of diversity in the accounting for PP&E. The AcSEC initially addressed only real estate, but the PSOP was expanded to cover all PP&E and accounting methods used for planned major maintenance activities in response to discussions with the FASB and Securities and Exchange Commission (SEC).

SFAS 143 is a consequence of suggestions by the SEC that decontamination of nuclear facilities represents an environmental obligation that should be recorded as a liability, and is in reaction to users of financial statements indicating that diverse accounting practices make comparisons difficult and that obligations that meet the definition of a liability are not being consistently measured or recognized. The Standard reflects the FASB's determination that accumulated provisions for depreciation should not be allowed to exceed the carrying amounts of the associated assets. With these SEC and FASB positions at odds with the typical electric utility practice of providing for nuclear plant decommissioning through depreciation and trust funds, in February 1994, the Edison Electric Institute asked the FASB to consider a project to address accounting practices related to a broader range of retirement obligations than the decontamination of nuclear facilities. The FASB responded by opting to address a broad range of retirement obligations, and in February 1996, issued an exposure draft of a proposed accounting standard pertaining to *legal and constructive* retirement obligations of regulated and non-regulated entities.

Many of those commenting on the initial exposure draft expressed a need for additional guidance for determining the types of retirement obligations that would be subject to liability treatment and the assets to which such obligations would apply. Many of the expressed needs for further guidance were requests for clarification that the standard would not apply to certain types of assets or obligations, thereby allowing continued treatment on a ratable basis through depreciation. Utilities were particularly interested in the standard not being applied to removal of components of asset groups for which life is indefinite, such as electric and gas transmission and distribution systems, and wanted clarification whether temporary storage costs of spent nuclear fuel would qualify for liability treatment.

The comments on the initial exposure draft generally agreed that the retirement obligations addressed are liabilities and that accounting guidance would be useful. However, there was considerable disagreement concerning the appropriate accounting treatment for such obligations. Prior to issuing the initial exposure draft, the FASB decided to not strictly define constructive retirement obligations. Numerous comments on the initial exposure draft suggested that the proposed definition of constructive obligations was too broad or too vague and would lead to inconsistent application.

The FASB's deliberations in response to these comments resulted in modifications significant enough for a second exposure draft to be issued in February 2000. The second exposure draft provided further guidance concerning constructive obligations, but again prompted comments on the difficulty in their identification. The FASB came to recognize that it could not define constructive retirement obligations tightly enough for consistent application of liability treatment to such obligations. Therefore, SFAS 143 limits the retirement obligations requiring liability treatment to legal obligations.

SFAS 143 provides only two choices for treating AROs – liability treatment and cash treatment – and does not distinguish between AROs for assets having distinct lives and for assets having indefinite lives. Spent fuel storage costs result from normal operations, so are subject to SFAS 143.

The possibility of alternative interpretations as to how AROs are to treat salvage is due to the second exposure draft stating in Paragraph 18b that the fair value of the liability is to reflect "offsetting cash inflows, if any." Salvage proceeds are offsetting cash inflows. The same discussion appears in Paragraph A20b of SFAS 143, but the reference to offsetting cash inflows has been removed.

net salvage ?

Therefore, SFAS 143 does not say anything about how salvage proceeds reflected in market prices or cash flows utilized to determine the fair value of the liability are to be treated.

Readers are encouraged to decide for themselves how SFAS 143 intends that salvage be treated, as I have received conflicting advice on the subject. Finding nothing to the contrary in SFAS 143, I concluded that salvage proceeds are to be considered when determining if an ARO exists, and an FASB spokesperson confirmed this interpretation. However, the Project Manager, who left the FASB after SFAS 143 was finalized, has advised me that excluding the exposure draft Paragraph 18b reference to offsetting cash inflows was intended to preclude incorporating salvage proceeds in AROs.

Depreciation Accounting Concept

The financial accounting definition of depreciation of the AICPA states:

> Depreciation accounting is a system of accounting which aims to distribute cost or other basic value of tangible capital assets, less salvage value (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.

The PSOP specification of the component depreciation accounting concept is inconsistent with the above definition's allowance of the group concept. However, other depreciation concepts can be utilized if they produce gross PP&E, depreciation expenses, depreciation reserves, and gains or losses on replacements and disposals that are not materially different from the component concept. The PSOP does not modify the above definition of depreciation accounting, and I have been told by the AICPA that the AcSEC gave no explicit consideration to it.

The proposal to require the component depreciation concept has the potential for influencing the PP&E accounting and financial statements of utilities, pipelines, railroads, and telecommunication companies, because USofAs require the group concept. This regulatory accounting requirement for the group concept is usually inherent in USofA rules concerning how PP&E retirements are to be recorded, rather than specifically stated.

Utilities, pipelines, railroads and telecommunication companies have two basic types of PP&E – that recorded for accounting purposes by location (location PP&E) and that not recorded by location (mass PP&E). Life can be related to individual locations for some types of location PP&E, such as power plants, gas transmission lines and pipeline compressor stations, and is often treated in this manner for regulatory depreciation accounting purposes. Such PP&E is referred to herein as *life span PP&E*.

Some types of location PP&E, such as electric substations and transmission lines, gas measuring and regulating stations, central office equipment and general purpose buildings, typically involve too many locations to deal with by individual location, so are treated in groups for regulatory depreciation accounting. Mass PP&E is treated in groups for regulatory depreciation accounting. Average life applies to location and mass PP&E treated in groups, and such PP&E is referred to herein as *average life PP&E*.

For the component depreciation concept, each component is recorded separately and is depreciated separately utilizing a unique service life. Depreciation accrual ceases when a component reaches its assigned service life, and the remaining book value of any component retired prior to reaching its assigned life is written off. Additions to an existing component are recorded either as a new depreciable component or as an expense. Additions that replace portions of components are expensed. Gains or losses are recorded upon retirement of non-depreciable assets, such as land. The PSOP distinguishes between disposals and replacements by requiring write-offs to be recorded as losses for disposals and as additional depreciation expenses for replacements. Separately depreciating each component limits the total number of components that are practical to deal with, which tends to simplify PP&E accounting records. The component concept is practical for life span PP&E, because the number of locations is limited, but is unlikely to be practical for average life PP&E.

The extent of write-offs and of components that remain in service after reaching their assigned life provides a basis for judging the accuracy of the assigned depreciation lives. Recording significant losses indicates lives that are too long. Many fully depreciated components that remain in service indicate lives that are too short. Having fully depreciated components is more likely than recording significant write-offs, because short lives indicate conservative accounting and it is easy to delay recording retirements until additional depreciation accruals minimize or eliminate write-offs.

For the group depreciation concept, PP&E components are combined into groups for depreciation purposes. For life span PP&E, depreciable life is defined by the life spans of major components and some measure of interim additions and retirements. For average life PP&E, depreciable life is defined by the average life of the group and a pattern of variation of retirement ages around this average. New and replacement additions are capitalized if the components are "retirement units" for which the entity's capitalization policy specifies capitalization. If not a complete retirement unit, new and replacement additions are expensed. Each retirement unit may or may not be separately recorded and its applicable depreciation is not separately recorded. Retired components are treated as being fully depreciated at the time of retirement, so write-offs are not recorded for normal retirements. USofAs allow recording of gains or losses incurred for extraordinary retirements (usually only upon receipt of specific regulatory approval), but my experience is that such retirements are rare. Depreciation continues after components reach the average life of the PP&E group, as long as the PP&E group is not yet fully depreciated.

For the most part, retirement units of utilities, pipelines, railroads, and telecommunication companies are physical descriptions of components of PP&E. The group concept, combined with a capitalization policy based upon physical descriptions, makes it practical to deal with the large number of capitalized components of the typical utility, pipeline, railroad, and telecommunication company. Special (depreciation) studies are required to judge the continued validity of depreciation life spans, measures of interim additions and retirements, average lives and retirement age variation patterns (mortality characteristics). The extensive detail of utility PP&E records allows conducting analyses of past experience that enhance the ability to accurately estimate the mortality characteristics that can be expected to be experienced by the existing PP&E.

An extensive body of knowledge, literature and tools has been developed for depreciation studies, and the Society of Depreciation Professionals (SDP) exists for those involved in such studies.

The significance of physical descriptions to the accuracy of PP&E accounting by regulated entities is illustrated by miscellaneous items for which USofAs allow capitalization decisions to be based on their value. Such items costing less than some amount selected by the entity are expensed. Utilities typically apply this capitalization practice to items such as furniture, office equipment, PCs, tools and instruments. Field personnel can easily relate to physical descriptions, but cannot relate to values, so usually dispose of these types of items without reporting retirements. The result is that the accounting records for such PP&E include items that no longer exist. While retirements were sometimes recorded based on periodic inventories, inventories are not cost effective and are of questionable accuracy. A few entities adopted retirement practices based on something other than field reporting for these types of PP&E. However, most entities were reluctant to address the problem in this manner until the Florida Public Service Commission began in 1987 to allow retirements of such PP&E to be recorded when it reaches an age equal to an assumed depreciable life. The Florida action prompted a flood of requests that the FERC allow retirements of miscellaneous items to be based on age. The FERC responded by issuing Accounting Release 15 to provide blanket approval to do so if several conditions are met. general plant amortized

The PSOP states six reasons for the AcSEC's decision to choose the component depreciation concept over the group concept. As is evident from following discussion of the applicability of each of these reasons to utilities, pipelines, railroads, and telecommunication companies, I am convinced they are not applicable. However, I am also convinced that the AcSEC is unlikely to provide any special consideration of the unique situation of regulated entities.

1. *"Component accounting more precisely allocates the cost of PP&E to the periods benefited by that PP&E."* Such precision will exist only if the component lives are more accurate than the mortality characteristics utilized for regulatory accounting purposes. The regulatory accounting mortality characteristics result from sophisticated studies that are typically subjected to regulatory

review. It has been my experience that regulatory review rarely enhances the accuracy of depreciation mortality characteristics. However, it has also been my experience that the mortality characteristics determined through depreciation studies that emphasize the understanding of past experience are accurate. Studies that emphasize the measurement of past experience tend to overstate life, but I doubt that such lives are any less accurate than lives typically utilized for the component concept. While this reason may be applicable to non-regulated entities utilizing the group concept, it is not applicable to the typical regulated entity.

2. *"A composite life may not be determined with a high degree of precision and may not reflect the weighted average useful lives of the PP&E asset's principle components."* Non-regulated entities utilizing the component concept commonly adopt depreciation lives shorter than are expected, in order to reduce or eliminate differences between book and tax depreciation and the possibility of incurring write-offs at the time of retirement. Such lives are not as accurate as are the regulatory accounting lives determined through a depreciation study emphasizing the understanding of past experience, and I doubt that they are as accurate as the lives determined through a depreciation study emphasizing the measurement of past experience. This reason is not applicable to the typical regulated entity. This situation not withstanding, depreciation lives shorter than expected are typically looked upon favorably.

3. *"The composite approach may conceal inaccurate estimates of expected useful life for long periods."* The fact that life estimate accuracy can be determined from accounting records is an advantage of the component concept. I have no knowledge of the extent to which this ability is actually utilized to trigger life changes for non-regulated entities, but I have seen a few financial statement disclosures of depreciable life changes by non-regulated entities. A special study is needed to test life accuracy for the group concept. Such studies are common for regulated entities, as is evident from the existence and membership of the SDP. Non-regulated entities are not represented in the membership of the SDP and I have not encountered such entities at training courses on conducting depreciation studies, which suggests that sophisticated studies do not serve as the basis for the depreciable lives of non-regulated entities. Both regulated entities and their regulators have adopted practices of requiring periodic depreciation studies to test the continued validity of lives. For example, FERC compliance audits raise an accounting compliance issue if the latest depreciation study of an entity subject to its jurisdiction is deemed to be too old. While this reason may be applicable to non-regulated entities utilizing the group concept, it is not applicable to the typical regulated entity.

4. *"By not recognizing gains or losses, the approach may not correct for changes in asset usage or other factors affecting actual useful lives as compared to expected useful lives."* I have no knowledge of the extent to which this correction ability is actually utilized to trigger life changes for non-regulated entities. However, regulation and the periodic review policies of management impose such corrections on regulated entities. I am but one of many whose livelihood has involved periodic testing of the continued suitability of regulated entity depreciation lives. This reason may be applicable to non-regulated entities utilizing the group concept, and it may also be applicable to non-regulated entities utilizing the component concept. This reason is not applicable to the typical regulated entity.

5. *"Control over PP&E may be reduced because detailed records may not be used."* The typical regulated entity has a large number of capitalized PP&E components, and maintains very detailed accounting records that I have found to be reasonably accurate. These detailed records are a key ingredient in the ability of periodic special studies to accurately determine regulated entity depreciation mortality characteristics. The more limited number of items that are practical for entities utilizing the component concept results in recording substantially fewer capitalized components than a regulated entity typically deals with. If non-regulated entities have records that are sufficiently detailed to support depreciation studies, why are such entities not represented in the membership of the SDP or in depreciation study training courses? While this reason may be applicable to non-regulated entities, it is not applicable to the typical regulated entity.

6. *"If individual PP&E units become idle, depreciation on those idle units may not be determined with the same precision as if those units were depreciated separately."* Regulators go to considerable effort to assure that the assets comprising rate base are used and useful, and impose rules governing how items not currently utilized to provide service are to be treated for

accounting purposes. I have no knowledge of similar oversight for non-regulated entities, but am aware that negative financial consequences of recording write-offs could cause managers to be reluctant to admit to the existence of idle facilities. This reason may be applicable to non-regulated entities utilizing the group concept, and it may also be applicable to non-regulated entities utilizing the component concept. This reason is not applicable to the typical regulated entity.

The general trend since WWII of increasing energy utility depreciation rates and a common tactic of some intervenors in regulatory proceedings may lead some observers to question my contention that the AcSEC's belief that that the composite approach may conceal inaccurate life estimates (reason #3) does not apply to regulated entities. My experience is that this rate trend has been driven more by salvage and cost of removal than by life. The intervenor tactic is to react to proposals to increase depreciation rates by proposing decreases, in order to carve out a negotiating position that might prompt the applicant to settle for not changing its depreciation rates. My experience is that rate differences resulting from this intervenor tactic are due more to disagreements about salvage, cost of removal and depreciation procedure than to disagreements about life. Therefore, I do not believe that this trend and tactic invalidate my contention.

Entities that do not qualify for the special accounting allowed by SFAS 71 would have to either adopt the component concept or utilize the group concept in a manner that complies with the PSOP. If I am correct in my belief that the AcSEC will not provide any special consideration for regulated entities, entities that qualify for SFAS 71 could continue to use the group concept for regulatory accounting and disclose any differences from financial accounting requirements as regulatory assets or liabilities. However, there is a group depreciation procedure available that would allow entities not qualifying for SFAS 71 to utilize the group concept and that would preclude qualifying entities from incurring regulatory assets or liabilities. This is the equal life group (ELG) depreciation procedure.

The ELG procedure produces the same depreciation expenses and reserves as would the component concept, because the retirement age variation pattern causes the assigned life of each component to be unique to that component and to not be the average life of all components comprising the group. Therefore, retired components will have reached their assigned lives, so are recorded as being fully depreciated at the time of retirement. In effect, ELG is the equivalent of the component concept with lives sufficiently accurate to keep there from being any normal retirements at ages less than the assigned life and any components living beyond their assigned lives.

The average life group (ALG) depreciation procedure currently utilized by most utilities does not match the component concept, because the life assigned to each component of each group is the average life of all components comprising the group. As for ELG, ALG involves a single life and retirement age variation pattern for each average life PP&E depreciable group. This life assignment and the associated (and incorrect) assumption that every component retires at an age equal to the average life of the group causes the ALG procedure to under-depreciate components retired at an age less than the average life, and to compensate by over-depreciating components retired at an age greater than the average life. Therefore, ALG does not produce the same depreciation expenses and reserves as would the component concept, so would be precluded by the PSOP.

Recording Cost Of Removal or Net Removal Cost

Cost of removal is as generic term that applies to either physical removal of PP&E or to safe abandonment. The PSOP reflects the AcSEC's conclusion that removal costs should remain associated with the removed asset, and not be associated with the replacement asset. USofAs and SFAS 143 also associate removal costs with the removed asset.

I have interpreted the intent of the reflection of salvage in the AICPA definition of depreciation accounting quoted earlier to mean net salvage, thereby encompassing cost of removal. My interpretation is based on two considerations. One consideration is that at the time this definition was issued, it was common for *salvage* to be utilized to mean either salvage proceeds or net salvage, and some still utilize this meaning. My other consideration is that both salvage and cost of removal are recognized as being applicable to the retired PP&E, so treating one of these end-of-life transactions differently from the other would introduce an inconsistency that would damage the reliability of financial statements. However, my interpretation is inconsistent with the PSOP and

SFAS 143, as they both preclude cost of removal from being recorded through depreciation.

The PSOP allows capitalization of demolition costs associated with the acquisition or lease of real estate. USofAs require accrual accounting and provide rules for incorporating cost of removal into the depreciation expenses recorded ratably over the life of the associated PP&E.

Some cost of removal would actually be recorded on an accrual basis for financial accounting under SFAS 143. Cost of removal for PP&E for which salvage exceeds cost of removal would be accrued through depreciation, if an ARO is to reflect net removal cost. Cost of removal for PP&E for which cost of removal exceeds salvage and for which a legal obligation exists would be accrued as a liability. Cost of removal exceeds salvage for most of the PP&E of regulated entities.

While not called depreciation, the liability treatment specified by SFAS 143 for legal obligations is identical to one form of compound interest (sinking fund) depreciation. This compound interest approach is a single-payment annuity, with the payment expensed ratably. For example, consider liability treatment for the net removal cost (or cost of removal) of a PP&E component having a life of 40 years with 3% annual cost escalation and an 8% annual discount rate. The expected net removal cost (or cost of removal) more than triples over the life of the component and its present value is about 5% of the ultimate net expenditure. This present value (asset retirement cost) is added to the depreciable cost of the component and is recorded as a liability. The remaining 95% of the ultimate expenditure is recorded as accretion expense, which during the final year of life is about 20 times the amount recorded during the first year. Therefore, liability treatment is accrual accounting, but is severely back-loaded. However, it is not as severely back-loaded as is the cash treatment required for AROs not qualifying for liability treatment under SFAS 143.

The difference between actual net removal cost (or cost of removal) and the recorded liability amount is treated as a gain or loss.

Only retirement obligations arising from a law, statute, ordinance, written or oral contract, or expectation of performance under the doctrine of promissory estoppel would require liability treatment. Remediation requirements for coal storage and ash disposal sites, decommissioning requirements of nuclear generating station licenses, and abandonment practices imposed by pipeline safety regulations are examples of legal obligations. Some other types of power plants may have license or siting agreements that require their removal. For example, the FERC claims that removal is an alternative to hydro project re-licensing. Equipment leases often give the lessor the option of requiring the lessee to dismantle the equipment and return it. Rights-of-way and franchise agreements may impose removal obligations. Building codes require demolition of abandoned structures, but demolition may not become a legal obligation prior to an abandonment decision.

The doctrine of promissory estoppel suggests that a broad range of AROs of regulated entities is likely to qualify for liability treatment. SFAS 143 defines this doctrine as "the principle that a promise made without consideration may nevertheless be enforced to prevent injustice if the promisor should have reasonably expected the promisee to rely on the promise and if the promisee did actually rely on the promise to his or her detriment." This doctrine suggests that entities regularly removing or abandoning their PP&E for purposes of public safety implies a promise to continue doing so, and that entities that have requested regulators to allow net removal costs (or cost of removal) to be incorporated into depreciation rates implies a promise to continue removing PP&E.

Other Aspects of the PSOP

The costs of general, administrative and overhead activities are to be expensed during each of the four PP&E project stages, whether incurred internally by the entity or by another enterprise on behalf of the entity. These costs are stated to "include rent, depreciation, and other occupancy costs associated with the physical space occupied by employees, and all costs (including payroll and payroll benefit-related costs) of support functions, which include executive management, corporate accounting, acquisitions, purchasing, corporate legal, office management and administration, marketing, human resources, and information systems." I interpret the PSOP as allowing capitalization during the last three project stages of payroll and benefits for such activities as supervision, engineering, PP&E accounting and storeroom operations that are directly related to specific PP&E, even if accomplished through payroll distributions rather than by direct charges to work orders.

The PSOP declares that the total cost of planned major maintenance activities is not a separate PP&E asset or component, so cannot be capitalized, except to the extent that PP&E components are replaced in the process.

The PSOP classifies feasibility studies as a component of the Preliminary Stage of a PP&E project, and requires such studies to be expensed.

Costs to relocate PP&E are to be expensed.

The expensing of low cost PP&E would not be precluded.

Inventory and depreciation of construction equipment utilized directly can be capitalized.

The PSOP makes no mention of the treatment of salvage proceeds, which are to be accrued on a ratable basis through depreciation.

The continued validity of estimated useful lives is to be assessed on an ongoing basis, which is consistent with the practices of regulators and the management of regulated entities.

Disclosure Details

The PSOP specifies that PP&E gross carrying amounts of the following categories be disclosed in financial statements or in the notes to financial statements:

Land and land improvements;
Buildings and building improvements;
Machinery and equipment; and,
Construction work in progress.

The categories that are depreciated are to be subdivided if costs that are significant to the category have expected useful lives significantly different from the category as a whole. The range of useful lives is to be disclosed for each category or subcategory. The PSOP provides subcategory examples of leasehold improvements, building equipment such as for heating, ventilating and air conditioning and elevators, and short-lived technology equipment within the machinery and equipment category.

In addition, disclosure is specified for the nature and amount of repair and maintenance expenses and of changes from the kinds or nature of such expenses recorded during prior reporting periods.

The disclosures required by SFAS 143 for legal obligations are:

General description of the obligation and associated assets;
Fair value of assets legally restricted for settling the obligation;
Reconciliation of the beginning and ending aggregate carrying amount of the liability, showing separately the changes attributable to (1) the liability incurred in the current period, (2) the liability settled during the current period, (3) accretion expense, and (4) revisions in the expected cash flows, whenever there is a significant change to one of more of these four components; and,
Upon initial adoption, the liability amounts at the beginning and end of each fiscal year presented.

Implementation Issues and Impact

The PSOP allows two options for initially applying the component depreciation concept to existing PP&E, one retroactive and the other prospective. With the exception of treatment of planned major maintenance activity, costs are not to be re-characterized as to capital and expense upon adoption of the PSOP. Planned major maintenance activity changes are to be treated as a cumulative effect of a change in accounting principle, and the other aspects are to be treated as changes in accounting estimates.

The cumulative effect approach is to be utilized to reflect transition amounts upon adoption of SFAS 143, with these amounts measured using current information, assumptions and discount rates. The cumulative effect approach would require re-characterization as to capital and expense upon adoption, so conflicts with the PSOP.

As is evident from the following discussion, developing an implementation strategy for the PSOP and SFAS 143 will be more difficult for regulated entities and for non-regulated entities practicing the group depreciation concept than for entities practicing the component concept.

Depreciation Accounting Concept

The deregulation inherent in the restructuring of the electric industry may influence the depreciation concept utilized in the future for power plants. Deregulation eliminates price regulation of electric generation, and if it also eliminates accounting regulation, owners of power plants would have the option of changing to the component depreciation concept that could simplify implementation of both the PSOP and SFAS 143.

Utilities, pipelines, railroads and telecommunication companies have too many PP&E components to change from the group depreciation concept, thereby complicating adoption of the PSOP. To illustrate, FERC Account 370, Meters, typically comprises less than five percent of the gross PP&E of the wires portion of an electric utility. Yet Account 370 for a medium size utility having 1,000,000 customers would likely contain at least 1,000,000 PP&E components, because physical descriptions (i.e., a meter) define retirement units.

Precluding the ALG depreciation procedure makes sense. Its inherent deferral of recording depreciation produces a mismatch between the usage of PP&E and the recording of that usage. This mismatch causes inflation of rate base that increases the cost of service, which is detrimental to customers and to the economy of the service territory. I am convinced that the group depreciation concept with the ELG procedure results in utility, pipeline, railroad and telecommunication company depreciation accounting that is more accurate than could be obtained from the component concept. However, regulated entities not already utilizing ELG are unlikely to adopt this procedure for regulatory accounting purposes without regulatory approval. Without a shift to ELG (perhaps only for financial accounting purposes), the major effect of the AcSEC's choice of the component concept will not be to improve the reliability of the depreciation accounting of regulated entities. The effect will be to force such entities to incur the extra cost of expanded depreciation accounting records to allow the measurement and disclosure of regulatory assets and liabilities.

The apparent concern of the AcSEC for the mismatch between the usage of PP&E and the recording of that usage that is produced by ALG depreciation rates is in conflict with the imposition of such a mismatch for AROs by SFAS 143.

The differences between ELG and ALG depreciation rates depend upon the age of the PP&E and the extent of the retirement age variation. An ALG depreciation rate remains constant over the life of a PP&E group, because it assumes that each component is retired at an age equal to the average life of the group. When there is no retirement age variation, ELG and ALG rates are identical. Retirement age variation causes an ELG rate to be higher than the constant ALG rate for young PP&E and to be lower for old PP&E. How much higher or lower and the age at which ELG and ALG rates are identical depend upon the extent of the retirement age variation. Adoption of the ELG procedure would typically increase depreciation expenses for energy utilities, because cost escalation and growth causes the average age of their PP&E to be young relative to the average lives of PP&E depreciable groups.

ELG is used extensively by telecommunication companies and less extensively by other entities. ELG procedures that comply with the PSOP are available for all types of PP&E. Some form of ELG is nearly always utilized for power plants. However, the ELG procedure applicable to life span PP&E that would allow continued use of the group concept involves consideration of expected future interim additions, which has made it difficult to obtain regulatory approval. The increase in depreciation expenses that usually results from adoption of ELG for average life PP&E has caused some regulators to be reluctant to authorize ELG. However, I am aware that the ELG procedure has been authorized for the average life PP&E of energy utilities by nearly a dozen states and by the FERC.

Rate base regulation causes the impact of depreciation expense changes on customers to reverse over the long-term. Thus, adopting ELG for regulatory accounting purposes would increase revenue requirements in the near-term and decrease them in the long-term. Political considerations tend to cause utility regulators to emphasize the near-term impact, so regulators often react unfavorably to ELG requests, causing many utilities to not even bother to ask. Perhaps the PSOP would prompt regulators to start thinking about customer's long-term interests and to cease objecting to ELG, and prompt regulated entities to consider whether keeping their depreciation accounting costs from escalating is sufficient reason to adopt ELG, perhaps only for financial accounting purposes.

Some entities may need to recognize that authorized depreciation lives are not suitable for the PSOP, if the depreciation lives deemed appropriate by the entity at the time of authorization were different from the authorized lives.

The different treatment of remaining book value, depending on whether PP&E is disposed of or is replaced, would have no influence on entities utilizing ELG, because the remaining book value would be zero. However, entities not utilizing ELG would have a remaining book value for PP&E components retired at ages less than the average life of the group, so would need to segregate replacements from disposals in order to record the remaining book value for replacements as additional depreciation and for disposals as a loss.

Entities not utilizing ELG would need to know or be able to estimate the in-service year (vintage year) of each PP&E component, in order to identify the components reaching the age at which depreciation must cease and to calculate the remaining book value to record as a loss or additional depreciation for any component retired at an age less than the assigned life. This need would impose a burden on those utilizing average installed costs to price retirements without distributing the recorded costs to vintages.

If the ELG procedure that complies with the PSOP is not utilized, depreciation expenses for regulatory accounting would be less than the depreciation and related losses for financial accounting, thereby producing regulatory assets.

Recording Cost of Removal or Net Removal Cost

The most significant influence on the SFAS 143 implementation effort is the decision as to whether liability treatment or cash treatment applies to AROs. Implementation is more difficult for liability treatment, particularly for entities that practice the group depreciation concept. Implementation of liability treatment for the component depreciation concept is simpler, because (1) each depreciable component is recorded and treated separately, thereby allowing depreciation to be specifically identified with each component, and (2) there are practical limits to the number of depreciable components that can be handled for accounting purposes.

Liability treatment involves acceptance of the legal implications of declared AROs and extensive initial and ongoing implementation efforts. Cash treatment involves no such legal implications and much less implementation effort, which might influence decisions concerning which treatment to adopt.

Cost escalation over the typically long life of the PP&E of utilities, pipelines and railroads causes cost of removal to become large relative to gross PP&E. Therefore, even though the PSOP, SFAS 143 and USofAs all relate removal costs to the removed assets, the differences between financial and regulatory accounting for these entities could be substantial.

The calculations for the liability and regulatory accounting models can both be described as annuities. The ratable regulatory accounting calculation is an annuity with periodic payments and an interest rate of zero, thereby producing equal period depreciation amounts. For interest rates other than zero, the regulatory calculation would be described as *sinking fund depreciation*. The SFAS 143 calculation for liability treatment is an annuity with a single payment. The financial assurance provided by a single-payment annuity (up-front funding) is acceptable to the NRC for nuclear facilities, but I believe that all internal and external sinking fund adoptions for power plants have involved periodic-payment annuities.

A given discount rate produces slightly more back-loading for a periodic-payment annuity than for a single-payment annuity. This situation is demonstrated by Figure 1, which compares the annual expenses for the single-payment liability treatment annuity with a periodic-payment annuity and with ratable treatment through depreciation accounting. The current cost of the obligation is $10,000, with a life of 40 years, 3% cost escalation and an 8% discount rate. The usage pattern of the associated PP&E is likely to resemble the ratable curve, so liability treatment produces a severe mismatch with the usage of the associated PP&E. If called depreciation, being rational, as is specified by the AICPA definition of depreciation accounting, would require recording net removal cost in the ratable pattern.

The initial exposure draft specified discounting using a risk-free borrowing cost. Changing to the credit-adjusted risk-free rate increased the extent of the back-loading of liability treatment.

The two annuities on Figure 1 are so close that one might draw the conclusion that the differences between SFAS 143 and the external funding of nuclear decommissioning obligations would not be sufficiently different to require disclosure. This may not be the case. The illustrated comparison utilizes the SFAS 143 discount rate as the decommissioning fund after-tax earnings rate. Higher or lower fund earnings will tilt the periodic-payment curve, with higher earnings causing a steeper slope and lower earnings causing less slope.

Figure 1 does not recognize that decommissioning typically occurs well after operations cease, and that the NRC limits to 2% above cost escalation the fund earnings beyond the termination date of the generating unit operating license that can be considered when calculating the fund contributions. Figure 2 better represents the nuclear decommissioning situation, using 5% earnings for the ten years beyond the 40-year operating life. A further complication is that owners of nuclear units may have site-specific cost estimates that differ from the generic estimates the NRC utilizes to test the adequacy of funding. At one time, the generic estimates were lower than site-specific estimates, because the generic estimates do not include the demolition costs of the remaining non-radioactive structures. More recently, the site-specific estimates are lower, because the generic estimates do not reflect the cost savings obtainable from reduction in volumes of radioactive materials obtainable through processing prior to burial.

In theory, regulatory accounting accrues net removal cost (or cost of removal) on a ratable basis over the life of the associated PP&E. In practice, the recording is nearly always back-loaded. Therefore, the influence of the PSOP and SFAS 143 on regulated entities will depend upon how closely their back-loading matches regulatory back-loading. My research suggests that, on average, the back-loading due to liability treatment for energy utilities would be similar enough for differences between financial accounting and regulatory accounting to be small. Therefore, the ratable line on Figure 1 is actually lower, more like $300 - $400 rather than the $800+ that is shown. However, I have found that individual utilities vary considerably from the average.

AROs not qualifying for liability treatment of net removal cost (or cost of removal) would produce regulatory liabilities that could be substantial. However, much less effort would be required to identify the accounting differences for this cash treatment than would have to be expended to identify the differences for liability treatment. Cash treatment differences can be identified by segregating the salvage and cost of removal portions of depreciation expenses and reserves and segregating the PP&E for which cost of removal exceeds salvage from that for which salvage exceeds cost of removal, which would not be difficult for most regulated entities.

It will be evident from the remainder of this discussion that implementing SFAS 143 is likely to involve use of averages for some types of PP&E. However, regulated entities will have to deal with specific projects or types of PP&E that vary significantly from the averages.

Treating the ARO for increasing radioactivity of a nuclear generating station as it operates as separate liabilities is unlikely to be either practical or relevant. While it takes several years for the radioactivity to build up, a large portion of the ultimate decontamination costs would apply to the first year of operation. Therefore, an effort to identify the inventory of radioactivity and the related decontamination activities to accounting periods is likely to be beyond the accuracy of the decontamination cost estimate.

Not re-characterizing costs as to capital and expense upon adoption of the PSOP means that previously accrued cost of removal residing in the depreciation reserve would be amortized on some basis, perhaps over the remaining life of the then existing PP&E. This would further increase financial and regulatory accounting differences, so further increase regulatory liabilities. However, as noted previously, re-characterization between capital and expense is required for adoption of SFAS 143, so the final SOP is likely to also require this re-characterization.

<u>Basis for Adoption</u>

It is clear that special studies similar to the depreciation studies conducted for regulatory purposes will be necessary to adopt and follow SFAS 143. Difficulties in obtaining data for the salvage and cost of removal aspects of depreciation studies have prompted some entities to limit the extent of this aspect of their studies. Such entities will need to expand their efforts for AROs that will require liability treatment.

Testing the continued validity of depreciation rates for regulatory purposes is appropriate every three to five years, depending on the emphasis of the study from which the rates are derived. Studies that emphasize measurement of the past need to be conducted more often than studies that emphasize understanding whether the past is a reasonable indication of the future. Figure 3 lists several study attributes that reflect these two approaches. Since the study needed for SFAS 143 must be future oriented, a regulatory depreciation study more than five years old is unlikely to provide a suitable basis for adoption.

It will be possible to utilize current cost estimates or to expand analyses of past experience made for regulatory purposes to estimate the future net removal cost (or cost of removal) for legal obligations that are needed for SFAS 143. While it has been my practice to prepare estimates of cost of removal that reflect future cost escalation when conducting depreciation studies, the estimates have not been allowed to be utilized for regulatory accounting. It has also been my practice to distinguish between salvage and cost of removal for most PP&E types, but some entities will have to deal with situations where this distinction was never considered or has been lost.

Studies will also be necessary to periodically test the continued validity of the assumptions used to calculate the liability amounts for new assets, and to test the adequacy of previously recorded asset retirement cost and liability amounts. Every five years or so is appropriate for such tests, but testing some portion of the assets qualifying for liability treatment every year or two may be reasonable to limit the magnitude of changes. The effect of assumption changes on recorded liability amounts are to be added to or subtracted from the initial liability amounts that were added to asset costs and to or from the existing liabilities, so changes will influence future depreciation and accretion expenses. Upward revisions to cash flows are to be considered as new obligations, so are discounted using the current credit-adjusted risk-free rate. Downward revisions are to be considered changes to the original obligations, so are discounted using the historical rate. Therefore, accounting systems will need the ability to track and modify the recorded asset retirement cost and liability amounts.

Implementing SFAS 143 by entities utilizing the group depreciation concept will require specialized expertise that has limited availability. Entities not previously utilizing such expertise for regulatory accounting purposes will have a steep learning curve, and will find that future oriented studies require more time, talent and data. A further complication is that downsizing may have eliminated personnel with critical knowledge and/or reduced staffing to a level below that needed for SFAS 143. Expertise availability and an adoption deadline well prior to when the needed new or modified accounting software can be expected to be available may combine to create implementation issues.

<u>Influence of the Age of Retired PP&E</u>

Past salvage and cost of removal experience in relation to the depreciable PP&E cost (salvage and cost of removal factors expressed as percentages) reflects a time difference between the salvage and cost of removal amounts recorded at the current price level and the PP&E cost recorded at the price level at the time of installation. If the age of past retirements is about the same as the expected age of the currently existing (surviving) PP&E upon retirement, the experienced factors are likely to reflect sufficient cost escalation and the proper mix between reused and scrap materials to be reasonable estimates of the future factors that would be discounted for obligations requiring liability treatment. However, the average age of past retirements will probably be less than the expected age upon retirement, so experienced factors are likely to reflect less cost escalation and a different mix of reuse and scrap than will be reflected in the net removal cost (or cost of removal) amounts recorded at the time surviving PP&E is removed or abandoned. For example, my experience is that the average age of past electric utility retirements is typically about one-quarter to one-third of the expected age of surviving PP&E upon retirement, and of gas utility PP&E is about one-third to one-half of the expected age upon retirement. Therefore, experienced salvage and cost of removal factors are likely to reflect less escalation and scrap and more reuse than can be expected over the PP&E remaining life. These cost escalation and reuse and scrap differences will need to be identified and dealt with when determining the parameters needed for applying SFAS 143 and for testing whether previously recorded asset retirement costs and liabilities should be adjusted for changed conditions.

A further cost escalation issue to be addressed for life span PP&E is that future escalation rates for cost of removal may have been understated for regulatory purposes and escalation rates for salvage may have been overstated. This situation can result from efforts of regulated entities to limit the issues in regulatory proceedings and from efforts of regulators and intervenors to reduce current depreciation expenses through deferral of recognizing costs for regulatory accounting.

<u>Influence of Accounting Practices</u>

Certain accounting practices will influence implementation of SFAS 143. Some practices will influence the initial and ongoing efforts, and some effect the magnitude of depreciation rates for regulatory purposes, so have the potential for influencing the differences between financial and regulatory accounting. Considering whether any of these practices should be modified should be an integral part of developing an implementation strategy.

The existence of continuing property records, which identify the year retired assets were placed in service, will simplify implementing SFAS 143. However, some entities having such records have decided not to utilize them for determining depreciation rates for regulatory purposes in order to reduce the data collection effort. Now may be a good time for such entities to revisit this decision.

Entities that do not identify the year that retired average life PP&E was placed in service may want to consider whether vintage accounting should now be adopted. Entities that utilize statistical techniques for determining amounts to retire will need to determine whether their techniques are suitable for SFAS 143 implementation needs.

Regulated entities will need to recognize that depreciation reserves often reflect transactions not suitable for reflecting in either regulatory accounting or implementation of SFAS 143. For example, USofAs require that construction costs be recorded net of any contributions for construction. Reimbursements from customers for construction are nearly always recorded in this manner, but reimbursements from others for such things as property damage and highway relocation are sometimes recorded in the depreciation reserve. Reimbursements for construction recorded in the reserve look like salvage, but they are not salvage, so should not be treated as salvage for SFAS 143. They should not be treated as salvage applicable to retired assets for regulatory accounting either, but sometimes are. Those recording construction reimbursements in the depreciation reserve may want to reconsider the practice. However, reducing retirement obligations by pretending that construction reimbursements are salvage may be desirable to some, if AROs are to reflect net removal cost.

Accounting principles specify that reused materials be recorded at lesser of cost or market value. However, entities that qualify for SFAS 71 sometimes record the salvage value of such materials at a market value that is considerably higher than cost. This approach was once quite common, and those still utilizing it may find that now is a convenient time to start recording original material cost, if AROs are to reflect net removal cost. However, even the original material cost may be too high, because it does not recognize that the component has already lived a portion of its useful life.

I have observed considerable variation among regulated entities in how accurately the labor for removing or safely abandoning a replaced component is segregated from the labor for adding the new component. The difficulty of implementing liability treatment may encourage entities with a history of recording some of the replacement labor as a cost of the new asset to continue the practice, or even to expand it. Treatment of removal and abandonment expenditures as a cost of the new asset would simplify implementation of SFAS 143 by reducing or eliminating AROs. Treating cost of removal as a cost of the replacement PP&E is consistent with AICPA Accounting Research Monograph 1, *Accounting for Depreciable Assets*, but is inconsistent with the position taken by the American Gas Association and the Edison Electirc Institute in responding to a recently aborted effort to adopt this treatment for Federal income tax purposes. Such treatment is also inconsistent with the PSOP, which states that the AcSEC determined that removal costs should remain associated with the removed asset, and not be associated with the replacement asset.

Regulated entities incorporate overheads when PP&E is constructed or acquired, and many recognize that such costs should also be recorded when PP&E is removed or abandoned. Entities that apply overheads to retirement work orders may want to re-evaluate this practice for PP&E for which the practice results in net removal costs (or cost of removal) that would require liability treatment.

Regulated entities commonly utilize cradle-to-grave accounting for types of PP&E that tend to be relocated, such as line transformers, gas regulators and meters. USofAs specify expensing the costs of relocating such PP&E. Recording cost of removal when such PP&E components are retired is a reasonable practice. However, entities that do so may want to reconsider the practice, if it causes net removal cost (or cost of removal) that would require liability treatment.

When closing out completed construction and replacement projects, some entities initially classify the PP&E on an estimated basis and later make corrections. Delay in accurate assignment of costs complicates the determination of depreciation rates for regulatory purposes, and may be even more difficult to deal with for SFAS 143.

It is not uncommon for the salvage and cost of removal on a large project to be recorded in a different year than the retirement amounts. This can be compensated for when determining depreciation rates for regulatory accounting, but may not be acceptable for SFAS 143. Entities not already utilizing accounting practices that eliminate such differences may want to consider starting.

Influence of Life

When removal or abandonment will occur is required to determine liability amounts. This life is the time until when the legal obligation will be satisfied, which may be different from the useful life of the associated PP&E. The large portion of net removal or abandonment costs (or cost of removal) to be recorded late in life under liability treatment demonstrates the importance of accurately estimating when AROs will be satisfied. Therefore, accurately estimating PP&E life will be an important aspect of implementing SFAS 143.

Non-regulated entities will have to deal with legal obligations that will be satisfied well beyond the conservative depreciable lives typically adopted to minimize or eliminate recording of losses and differences between book and tax depreciation. If regulators require depreciable lives for regulatory accounting that are longer than the lives proposed by the regulated entities, which is often the case, the shorter lives may be the appropriate basis for determining the net removal cost (or cost of removal) for liability treatment. With the exception of replacement of transmission and distribution system components, regulated entities are unlikely to remove facilities at the time they cease to be used and useful for regulatory purposes. Therefore, the depreciable lives for regulatory purposes of facilities such as power plants may be shorter than the lives needed for liability treatment.

Legal obligations to be satisfied at times different from the depreciable lives utilized for regulatory purposes will complicate adoption of SFAS 143. Life differences from regulatory accounting will be common and will deserve careful consideration.

Influence of Discounting

The life of most of the PP&E of regulated entities for which net removal cost (or cost of removal) is commonly recorded will be long, so corporate bonds will provide the appropriate discount rate. Bond market interest rates vary daily, but annual averages must be used for average life PP&E, and may be reasonable for life span PP&E also.

Power plants often have multiple generating units placed in service at different times, each unit will have a unique discount rate for liability treatment, and some plant components serve the unit with which they are installed as well as units that will be installed later. Each entity will have to decide whether a blended discount rate applicable to a power plant or a group of power plants or stratification by unit or installation year will be most practical, considering the needs for initial application to existing PP&E, for incorporating new PP&E, and for testing the continued validity of estimate assumptions and calculating modifications to recorded asset retirement cost and liability amounts. A decision also will be needed for average life PP&E subject to liability treatment, and may not be the same as the decision for life span PP&E. Dealing with average lives makes application more complex for average life PP&E, and may make vintage stratification impractical for testing the validity of the recorded asset retirement cost and liability amounts applicable to surviving PP&E.

Blended discount rates will change for life span PP&E as future net removal cost (or cost of removal) amounts applicable to PP&E installed at different times change. Blended rates will change annually for average life PP&E, as components are added to and retired from the PP&E groups. If blended discount rates are utilized, decisions will be necessary on how often to identify discount rate changes and when to modify these rates.

The original discount rate is to be used when downward revisions are made to future cash flow estimates, and the current discount rate is to be used for upward revisions. This will complicate ongoing application of SFAS 143, because a single asset could have multiple asset retirement costs, each with its own unique life, and multiple liability amounts, each with its own unique discount rate.

Regulated entities have long been confronted with proposals for back-loading the recording of depreciation for high cost facilities, such as power plants. To their credit, regulators usually deny such proposals, because of concern for the resulting deferral in recording the costs until the facilities are old and unlikely to be very productive. Now sanctioning back-loading for some of these costs for financial accounting purposes can be expected to expand the extent of back-loading net removal cost (or cost of removal) for regulatory accounting, and proposals to do so have already begun.

Probability Weighting of Present Value

Probability weighting means that the remote possibility of a legal obligation for which the probability is other than zero requires liability treatment.

Probability weighting for liability treatment would be quite complex for average life PP&E, whereby retirement age variation patterns are an integral aspect of life estimates. If the probability weighting for average life property is symmetrical, the average date when the obligation is expected to be satisfied would not change. However, the present value would change, because discount rates are different from cost escalation rates. Applying probability weighting to the cost estimate is manageable. Applying probability weighting to the present value calculation complicates complying with SFAS 143 without improving reliability.

Influence of Regulation

Depreciation rates for average life PP&E are based on life, salvage and cost of removal applicable to groups of PP&E. The common practice of stressing past experience when selecting average lives, salvage and cost of removal factors for regulatory purposes may make them inconsistent with the expectations of management. If so, regulated entities will have to decide whether the regulatory lives and factors are suitable for estimating retirement obligations.

Understanding the past is a reasonable step in predicting the future, so measurement of the past is an important aspect of a depreciation study and is a clerical process that requires no special expertise to perform. Understanding the past and its significance to the future requires special expertise that may not be available or may not be applied for regulatory purposes. Applying such expertise commonly leads to the realization that the past often overstates the average life and salvage that can be expected in the future and understates the cost of removal. Telecommunication industry experience provides an indication of the importance of this situation to other entities that are or were once regulated. Starting with U.S. West in 1993, telecommunication companies have recorded large asset impairment write-offs as a result of concluding that their depreciable lives for regulatory purposes were substantially overstated.

Regulated entities calculate depreciation expenses by applying to the depreciable PP&E cost a depreciation rate that incorporates a credit for salvage and a charge for cost of removal. The rate incorporates salvage and cost of removal in relation to the depreciable asset cost, expressed as a percentage (factor). Determining depreciation rates for regulatory purposes involves estimating *past, future* and *average* salvage and cost of removal, and, for some types of assets, *current* salvage and cost of removal. *Current* is that which would be recorded for immediate removal or abandonment. *Past* is that which has already been recorded for past removals or abandonments. *Future* is that which is expected to be recorded at the time the surviving PP&E is removed or abandoned, and is of interest for regulatory purposes, because it is the basis for calculating remaining life depreciation rates. Future salvage and cost of removal is of interest to SFAS 143, because it is the amount to discount for recording an ARO that requires liability treatment. *Average* is the average of the *past* and *future* salvage and cost of removal, and is of interest for regulatory purposes, because it is the basis for calculating whole life depreciation rates.

For life span PP&E, regulation often limits the salvage and cost of removal for regulatory accounting to current salvage and cost of removal. For average life PP&E, regulation nearly always limits the salvage and cost of removal for regulatory accounting to past salvage and cost of removal. Some regulators have taken actions that further limit the cost of removal reflected in depreciation rates. If regulators have not allowed depreciation rates to reflect net removal cost (or cost of removal) factors that are consistent with the PP&E lives, the factors reflected in existing depreciation rates would not be representative of the future amounts to be discounted for PP&E requiring liability treatment.

Even though in conflict with their USofAs, some regulators have not allowed accrual accounting to be used for salvage and cost of removal. Cash treatment for regulatory purposes that has been in place a long time and kept current will simplify adoption of SFAS 143, since the depreciation reserve would contain no net removal cost (or cost of removal) to reverse. However, these two conditions (long in place and kept current) will not exist for many of the regulated entities that have been denied accrual accounting for salvage and cost of removal. A further complication is that many of the cash treatment requirements have been implemented in a manner that hides the fact that accrual accounting has been denied.

The politics of regulation often results in regulatory accounting being based on longer than planned lives for electric generating units. Therefore, some entities may need to recognize that regulatory retirement dates known to be inconsistent with future expectations for life span PP&E would not be appropriate for determining asset retirement cost and liability amounts.

It may be desirable to use fewer average life PP&E groups for financial accounting than for regulatory accounting. However, it is difficult to develop an understanding of the past and its significance to the future when PP&E groups are larger than primary plant accounts. Further, determining differences between financial and regulatory accounting will be facilitated by utilizing the same groups for both. Therefore, the depreciable groups utilized for regulatory accounting may be reasonable for the PSOP and SFAS 143 as well.

Estimating Net Removal Cost (or Cost of Removal) for Life Span PP&E

The ability to relate end-of-life accounting transactions to specific locations will make application of SFAS 143 for life span PP&E requiring liability treatment simpler than for average life PP&E. However, past salvage and cost of removal experience may be less useful for life span PP&E than for average life PP&E, due to limited removal experience or past removal circumstances so different from the expected future circumstances that the past does not provide a reasonable indication of the future. For example, much of the past removal experience for steam power plants is for small units having self-supporting boilers that could be demolished using less expensive processes than are dictated for surviving units that are much larger and have boilers hung by their tops from massive steel structures. A further complication is that experience may be for units having asbestos insulation that was more expensive to deal with than can be expected for the insulation on modern units.

The external funding requirement of the NRC for decommissioning of nuclear power plants has resulted in the general availability of site-specific removal cost estimates that include the timing of removal. Calculating nuclear trust fund contribution amounts requires that estimates reflect future price levels. However, some entities will have to deal with situations when regulators have not allowed all of the decommissioning costs indicated by site-specific estimates to be reflected in regulatory accounting, or have utilized the NRC's generic cost estimates rather than site-specific estimates.

A number of utilities have conducted site-specific removal cost estimates for their non-nuclear power plants for regulatory accounting. Such estimates may include how long removal will take, but may not have considered when removal will start, so may reflect only the current price level and the assumption that removal is instantaneous. It will not be difficult to utilize current cost estimates to calculate future salvage and cost of removal amounts that reflect the estimated price level at the time of removal or abandonment. The life aspect of future cost estimates will be available from predicted generating unit retirement dates and the expected removal or abandonment timing, and the estimate details will allow application of cost escalation rates specific to the various categories of costs.

Entities that would need to rely upon current net removal cost (or cost of removal) estimates for life span PP&E, and do not already have access to such estimates, may not be able to obtain them in time to implement SFAS 143. Electric utilities that have not conducted their own estimates for non-nuclear power plants should consider whether the estimates of others provide a suitable basis for initial application of SFAS 143. My 1996-1997 SDP Journal article, *Power Plant Removal Costs Revisited*, summarizes the results of removal cost estimates for 31 electric utilities for steam, combined cycle, combustion turbine and diesel power plants that are a matter of public record. That Journal article expressed the costs as net removal costs per kW of capacity, but the reflected salvage proceeds represent scrap values, so tend to be low.

Removal cost estimates have been made for hydraulic power plants, but are too limited, the plants are too unique, and the extent of demolition is too variable for estimates of others to be meaningful. The publication of the American Society of Civil Engineers, *Guidelines for Retirement of Dams and Hydroelectric Facilities*, may be helpful to entities having hydraulic plants. While I am aware that removal cost estimates have been made for other types of life span PP&E, with the exception of pipeline compressor stations and offshore gas and oil facilities, most are not in the public record, so are not available to other entities.

Under group depreciation for regulatory purposes, periodic replacements of life span PP&E components will be capitalized and are likely to incur net removal cost (or cost of removal). Assuming that such obligations relate to ongoing operation, not to retirement, would simplify implementation of SFAS 143, but may not be consistent with the intent of SFAS 143.

Estimating Net Removal Cost (or Cost of Removal) for Average Life PP&E

The expected life of average life PP&E is defined by the average service life and the pattern of the age variation of retirements around the average life. This pattern is defined by standard curves, such as the Iowa-type commonly adopted by entities other than telecommunication companies. Such curves typically indicate that retirements start shortly after property is placed in service and continue for a period about double the average life. While some may be tempted to develop complex computer models to deal with each individual retirement age, doing so may not be practical. Therefore, relying on average lives and average net removal costs (or cost of removal) is likely to be a reasonable approach to implementation of SFAS 143.

Entities utilizing standard costing to determine removal or abandonment labor costs for accounting purposes may be able to calculate their current cost of removal by applying standard costs to inventories of surviving and new PP&E. If standard costing is not the basis for removal or abandonment costs for regulatory purposes, analyses of past experience will be the most practical approach for the cost of removal of average life PP&E.

The analyses of past salvage and cost of removal experience incorporated into depreciation studies involve relating the recorded salvage and cost of removal amounts to the depreciable costs of the associated PP&E, resulting in factors expressed as percentages of original cost. Such studies usually deal with groups of PP&E and salvage and cost of removal activity that is not aged. While salvage and cost of removal may be aged for tax depreciation purposes, my experience has been that such aging usually is not suitable for conducting depreciation studies and will not be suitable for implementing SFAS 143.

Experienced salvage and cost of removal factors will reflect the future amounts needed for liability treatment only if the age of the PP&E that has been removed or abandoned is about the same as the expected age of the surviving PP&E upon removal or abandonment, which is unlikely to be the case. The likely situation is that the PP&E that produced the past salvage and cost of removal will be much younger. Therefore, an analysis step beyond that typically utilized for regulatory accounting purposes will be necessary for SFAS 143.

The second analysis step I have utilized for depreciation studies is to recalculate the cost of removal factors as if the removed or abandoned PP&E had been the same age as the expected age of the surviving PP&E upon retirement. This approach has the advantages of (1) relying on published data for past cost escalation experience that is specific to the PP&E, and (2) eliminating the need to predict future cost escalation of labor intensive activities for which published predictions may not be available.

Another approach to the second analysis step would be to apply estimates of future cost escalation to past cost of removal experience. The age aspect of this is not difficult, because the average age of the PP&E responsible for past cost of removal is available directly from the data utilized for the life analysis aspects of depreciation studies or can be calculated therefrom. However, predictions of future cost escalation rates may not be available for the mix of activities inherent in the removal or abandonment of the average life PP&E of regulated entities.

Assuming that past and future salvage factors are identical will simplify implementing SFAS 143 (if AROs are to reflect net removal cost), but will be more suitable for entities that base the salvage value of reused asset components on cost than for entities using the current market value.

Initial Application

The initial application of SFAS 143 requires identification and reversal of the net removal cost (or cost of removal) amounts currently residing in the depreciation reserve, and reinstatement of the net removal cost (or cost of removal) that would have been recorded under the Standard for legal obligations. Most regulated entities have recorded substantial amounts of net removal cost (or cost of removal) that must be reversed. For PP&E requiring liability treatment, net removal cost (or cost of removal) will later be accrued again. For PP&E requiring cash treatment, net removal cost (or cost of removal) will later be recorded again.

The most accurate approach to reversal is to quantify all past reserve transactions involving salvage and cost of removal, which are the depreciation accruals and the salvage and cost of removal recorded at the time retirement work orders were closed. However, availability of past records may keep this approach from being practical for many entities, and, even if records are available, the analysis effort may exceed personnel availability. Therefore, shortcuts are likely to be necessary.

Initial liability amounts will reflect the present value of the future net removal cost (or cost of removal) applicable to the currently surviving PP&E and to retired PP&E not yet removed, which may be different from the past net removal cost (or cost of removal) currently recorded in the depreciation reserve. Past accretion of liability amounts will reflect the passage of time since the PP&E was originally placed in service.

Continuing Application

There are three major aspects to the continued application of SFAS 143 for PP&E having legal obligations:

- New PP&E placed in service;
- Retired PP&E and satisfaction of the associated retirement obligations; and,
- Periodic testing of the continued validity of the assumptions for calculating initial liability amounts and for adjusting recorded asset retirement costs and current liabilities for changed circumstances.

Calculations of the initial liability amounts will need to be incorporated into the construction unitization process for average life PP&E and perhaps for life span PP&E as well. Continued application will dictate that original cost be segregated from the initial asset retirement cost amounts added to PP&E carrying amounts. Property record systems will need to maintain a link between the original cost of each property component and its related carrying amount increase. Property record systems will also require an ability to modify asset retirement costs for changed circumstances and to track multiple amounts for a given PP&E component or group of components. Depreciation study experience suggests that the most logical segregation for implementing SFAS 143 for average life PP&E will be the primary plant accounts or sub-accounts typically utilized for such studies.

The type of study necessary for testing the continued validity of the parameters for calculating initial asset retirement cost and liability amounts and for determining whether recorded asset retirement costs and liabilities should be adjusted for changed circumstances would be similar to the type of study utilized for testing the continued validity of depreciation rates. However, unlike depreciation studies that can be implemented only when authorized by regulators, the studies for continued application of SFAS 143 would be implemented immediately. Depreciation studies of average life PP&E are typically conducted by primary plant account or sub-account, and are sometimes summarized to produce a composite depreciation rate applicable to a larger group of PP&E. While SFAS 143 does not preclude similar summarizing for continued applicability studies, testing the continued validity of calculation parameters probably would best be done by account or sub-account. No matter the detail, the sensitivity of salvage and cost of removal to the age of the retired PP&E discussed earlier will make rather subjective the judging of whether asset retirement cost and liability amounts should be adjusted for changed circumstances.

Continuing application needs could dictate that regulatory depreciation and financial depreciation and liability accretion be segregated into several components, and that each PP&E component or group be identified with one of the following categories, if AROs are to reflect net removal costs:

- Salvage exceeds cost of removal;
- Cost of removal exceeds salvage with liability treatment; and,
- Cost of removal exceeds salvage with cash treatment.

For example, the typically single regulatory depreciation rate for each depreciable PP&E group might be segregated into separate original cost, salvage and cost of removal components. For financial accounting, depreciation might be segregated into separate original cost and initial asset retirement cost and liability amount components. Identification of two or more retirement amounts (original cost and initial or modified asset retirement costs) for each retired unit of property qualifying for liability treatment and the difference between the recorded liability and the actual net removal cost (or cost of removal) will complicate the closing of work orders. A retirement unitization process that identifies recorded salvage and cost of removal with the retired PP&E and by vintage could be a further and more significant complication.

If AROs are to reflect only cost of removal, there will only two PP&E categories – cost of removal requiring liability treatment and cost of removal requiring cash treatment. If AROs are to reflect net removal cost, there may be reason to reduce complexity by applying SFAS 143 only to cost of removal, thereby limiting the number of PP&E categories to only two. However, it should be recognized that doing so might shift some legal obligations from being immaterial, thereby not requiring disclosure, to being material.

Other Issues

For liability treatment, the depreciable PP&E cost will be higher for financial accounting than for regulatory accounting. For cash treatment, the depreciable PP&E cost will be the same for financial accounting and regulatory accounting. Depreciable PP&E cost has always been different for regulatory and tax depreciation, and now three different costs may have to be dealt with.

The higher PP&E cost recorded for legal obligations may increase property taxes. Recorded amounts that represent an expected future obligation should be a negative value component, so value increases should not occur as a result of liability treatment. However, increases may happen as a consequence of how ad valorem tax values are derived, suggesting faulty derivation methods.

Users of financial statements may not understand the significance of the proposed disclosures for legal obligations. It is just as well that SFAS 143 does not require disclosure of the magnitude of the future obligations, because users of financial statements may be shocked at their size for regulated entities.

Other Aspects of the PSOP

If I am correct that the PSOP allows capitalization of payroll and benefits for such activities as supervision, engineering, PP&E accounting and storeroom operations, this aspect of the PSOP would have little or no impact on utilities, pipelines, railroads and telecommunication companies, unless overheads include occupancy costs. Any differences between the PSOP and regulatory accounting would create regulatory assets.

Electric utility regulatory accounting complies with the PSOP concerning planned major maintenance activities. However, some electric utilities have been allowed to capitalize aspects of power plant refurbishment projects that would produce regulatory assets. The affected entities are those that have received FERC authorization to capitalize all project expenditures for formal generating unit life extension projects, including expenditures that USofAs dictate would otherwise be expensed. The PSOP may influence independent power producers that are affiliates of utilities.

USofAs allow the costs of feasibility studies to be accumulated in a balance sheet account, with the costs of studies that do not lead to construction projects eventually written off and the costs of studies that do lead to construction projects transferred to plant accounts. The PSOP not allowing such capitalization would create regulatory assets.

Expensing relocation costs would have little affect on energy utilities, pipelines, railroads and telecommunication companies, because maintaining continuity of service usually requires that relocation projects involve constructing new PP&E prior to removing the old PP&E, rather than merely moving the old PP&E.

The other aspects of the PSOP that were discussed above would not influence regulated entities, because they are the same as the requirements of USofAs.

Disclosures

The four disclosure categories for gross PP&E are consistent with the primary plant accounts specified by USofAs and how regulated entities typically utilize these accounts for construction and depreciation accounting purposes. Most USofAs do not require depreciation reserves to be in the same detail as the plant accounts, so some entities do not segregate reserves for buildings from those for machinery and equipment. However, this situation would not influence adoption of the PSOP, because reserves are not required to be disclosed by PP&E category and subcategory.

A disclosure example provided with the PSOP suggests that the AcSEC contemplates category subdivision when lives are half or less of the life of the major type of PP&E. I have found life differences of this magnitude common for the machinery and equipment recorded as Distribution and General Plant by energy utilities. The same disclosure example shows subcategories comprising as little as 4% of the total category gross PP&E amount, suggesting that life differences rather than PP&E amounts are to dictate category subdivision.

Composite Impact

The composite impact of the PSOP and SFAS 143 will be unique to each entity, so will need to be specifically addressed by each entity. However, some generalizations are possible. The majority of the PP&E of gas utilities is likely to be subject to legal obligations, so on average such entities would probably produce more regulatory assets than regulatory liabilities. If the promissory estoppel doctrine does not impose a legal obligation, the majority of the PP&E of electric utilities is likely to require cash treatment of net removal cost (or cost of removal), so such entities would probably produce more regulatory liabilities than regulatory assets.

The retirement and removal activities for many types of PP&E tend to be sporadic. Therefore, managers of entities that do not qualify for SFAS 71 may succumb to pressures to utilize the timing of retirement and removal activities to control period financial performance.

Adoption

The inability I perceive for utilities, pipelines, railroads and telecommunication companies to utilize the composite depreciation concept suggests that such entities would have three options for adopting the depreciation concept aspect of the PSOP. One option would be to apply the group concept in a manner that produces the same gross PP&E and depreciation expenses and reserves as would the component concept.

Another option would be to maintain records of remaining book value of young retirements and of the depreciation for old PP&E that would cease for financial accounting. Entities not qualifying for SFAS 71 would utilize these records to report losses and depreciation expenses and reserves, and qualifying entities would utilize them to adjust expenses and reserves and to disclose regulatory assets or liabilities.

The third adoption option is likely to be attractive, as it would preclude doing anything in reaction to the PSOP. This option would be to presume that the composite impact of adoption is not material, due to offsetting regulatory assets and liabilities, so not require disclosure. It would not be difficult to expand the scope of a depreciation study to test this presumption. However, there may be a reluctance to make such a test, in case it produces the wrong answer.

Non-regulated entities will cease recording net removal cost (or cost of removal) through depreciation. Regulated entities will have to segregate net removal cost (or cost of removal) for regulatory accounting and segregate the net removal cost (or cost of removal) of PP&E requiring liability treatment from the PP&E requiring cash treatment.

The cumulative effect of adoption is to be recorded upon implementation of SFAS 143, based on the assumption that the standard had been in effect at the time the existing PP&E was placed in service and that the current conditions applied at that time.

Conclusion

A predominance of regulatory liabilities means that depreciation for regulatory accounting is higher than for financial accounting, which users of financial statements are likely to consider favorable. However, this situation may be misleading to many such users, because it would be driven by financial accounting that defers the recording of substantial costs related to the PP&E utilized to provide service until after that PP&E ceases to be productive. This mismatch violates the intergenerational equity concept of regulation, as it would shift a portion of the cost burden from the customers currently served to a later generation of customers. In my view, this mismatch is also poor accounting.

The AcSEC proposal to preclude use of the group concept is intended to better match the recording of depreciation with the usage of the PP&E being depreciated, which I believe would not occur for regulated entities. Precluding depreciation accounting for net removal cost (or cost of removal) would destroy any match between such costs and the usage of the associated PP&E. This inconsistency assures that the PSOP and SFAS 143 will damage the reliability of utility, pipeline, railroad and telecommunication company financial statements, if reaction is something other than to just ignore them due to lack of materiality.

SFAS 143 is intended to address perceived diversity in accounting for net removal cost (or cost of removal). I do not see this diversity changing much for regulated entities. However, some users of financial statements are likely to be misled into believing that this diversity has been addressed.

This brief discussion is not a substitute for reading the PSOP and SFAS 143. While portions of SFAC 7 are quoted in SFAS 143, SFAC 7 deserves to be read also. SFAC 7 and other pronouncements have provoked enough controversy to prompt the FASB to initiate a new publication, *Understanding the Issues*, to better explain itself. So far, there have been four issues of this publication on SFAC 7, which also should be read.

Figure 1

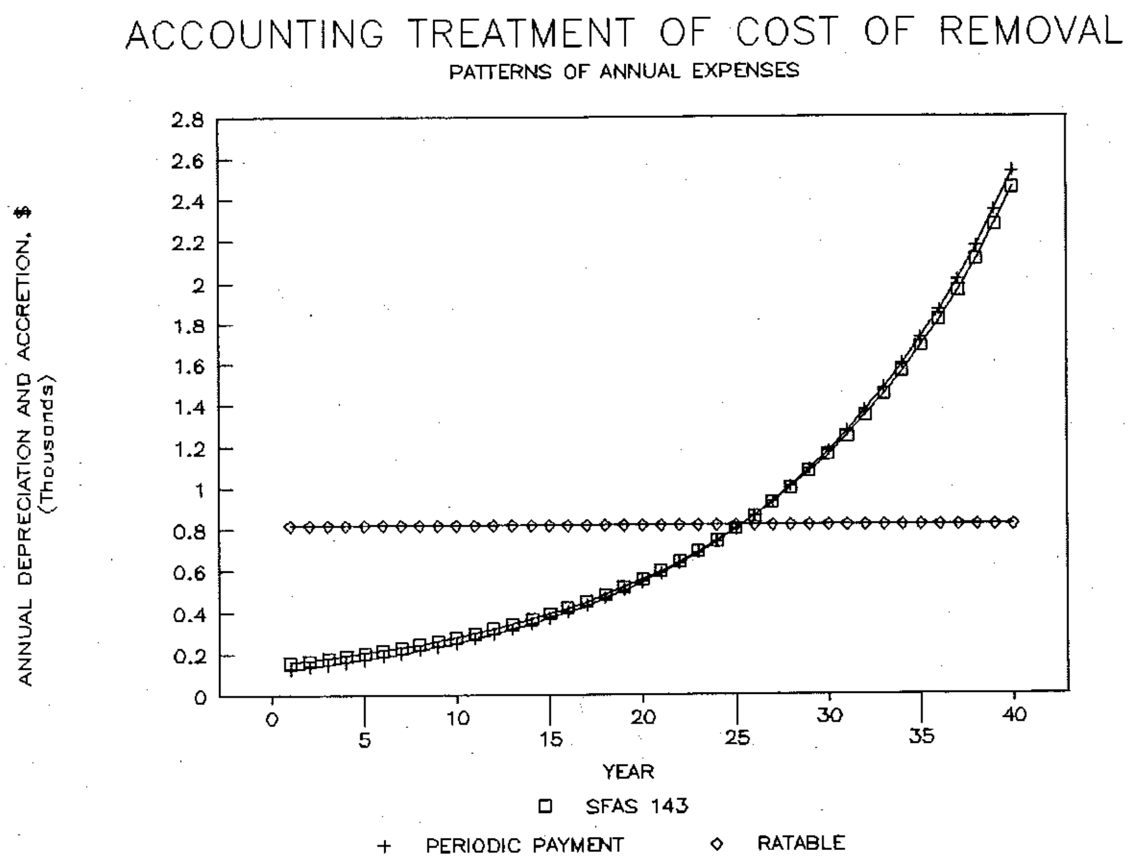


Figure 2

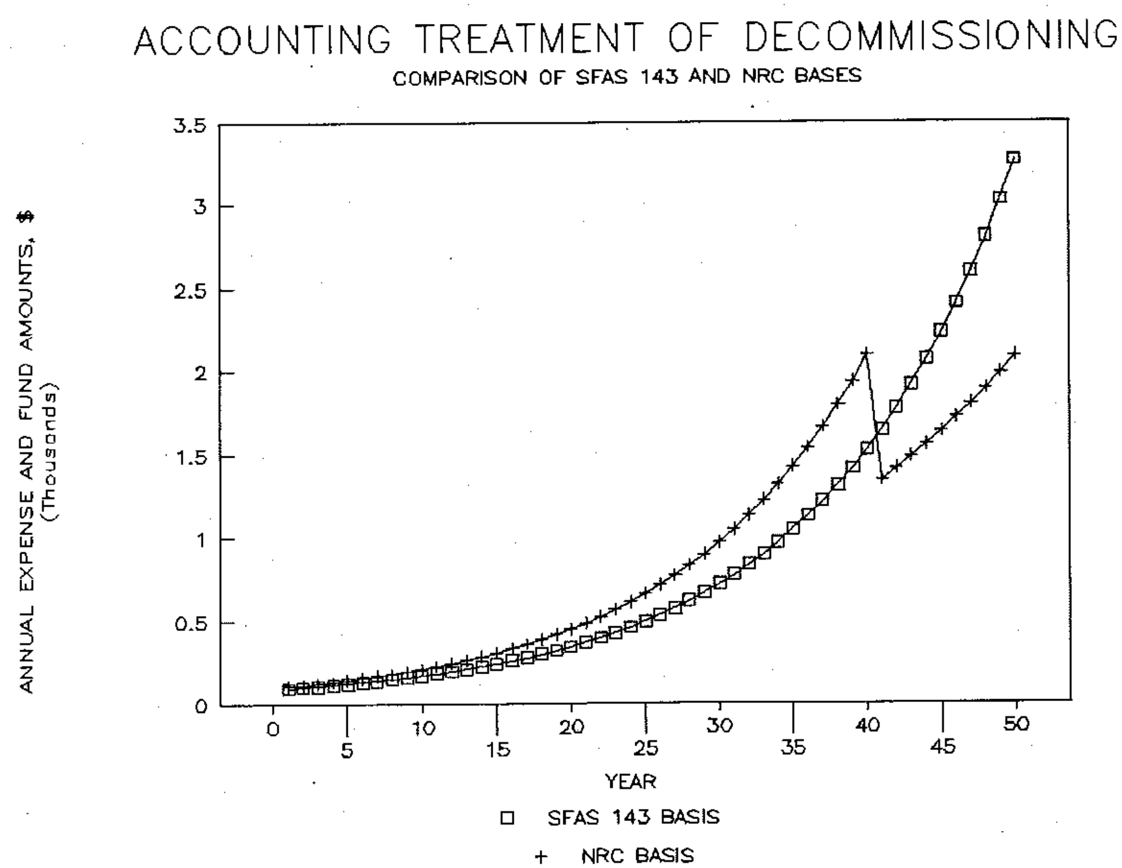


Figure 3

ATTRIBUTES OF DEPRECIATION STUDIES
THAT EMPHASIZE THE MEASUREMENT OF HISTORY
AND THAT EMPHASIZE THE UNDERSTANDING OF HISTORY

Attribute	Measurement of History	Understanding of History
Data collected beyond that needed for life and net salvage analyses	No	Yes
Unaged life analysis data used when aged data are available	Yes	No
Type of Simulated Plant Record life analysis procedure used	Balances	Period Retirements And Possibly Balances
Life and net salvage analysis effort balance	Heavy on Life Analysis	Balanced
Analysis procedures used in a manner that illustrates trends	No	Yes
Involvement of in-house personnel beyond data collection	Limited	Extensive
On-site activities of consultant	Limited	Extensive
Extent of use of industry data	Extensive	Limited If At All
Extent of explanation of study conclusions in report & workpapers	Limited	Extensive
Emphasis in regulatory proceedings	Study Techniques	Reasons For Conclusions
Regulatory proceeding interest in computer calculations	High	Low
Probability of prevailing in adversarial regulatory proceedings	Low	High

The 4R's of Life Cycle Planning

Don Bjerke

Abstract

Life Cycle Planning is a supportive process to the Management Planning Process of setting objectives, determining strategies, scheduling and evaluating. This process also contains four steps that the author has called the 4R's of Life Cycle Planning. These are: "Recommending," "Recording," "Reporting," and "Reviewing."

Introduction

Life cycle planning involves following projects as they flow through a system from their conception to their demise. Each step of the process requires a discipline which the author[1] refers to as the 4R's. Their application should fulfill the internal requirements of a company and at the same time withstand any external information requirement.

Recommending

In recommending a project within any organization one should go through a process of conducting an economic analysis. This process involves conducting a NPV (Net Present Value) study of all future revenue and cost cash flows to judge it's viability. A crucial input to this study is the life cycle parameters that specify the capital expenditure's life estimates, gross salvage, removal costs and survivor curve characteristics. Exhibit A shows how these life cycle parameters pertain to a life cycle curve. The life cycle curve consists of a series of survivor curves all of which have the same dispersion about the life cycle's average retirement age. Note also that these survivor curves also become less steep with each subsequent capital expenditure. It has been found that each subsequent survivor curve can be determined using the relationship of the average service life of the life cycle curve to that of the survivor curve for the capital expenditures. This relationship is described at the bottom of Exhibit A.

Recording

Once recommended, approved, and implemented, the project's transactions are now recorded in the general ledger system. One of the major journal entries aside from the revenues and the cash expenses is that of depreciation. In this step life cycle parameters used in conducting the economic analysis are used in determining the depreciation accruals. Exhibit B shows how these accruals are determined by using the SL (straight line) method, ELG (equal life group) procedure and a WL (whole life) technique depreciation system. Notice that the smooth declining life cycle curve is the result of using an ELG procedure. This would not be the case using a VG (vintage group) procedure. A reserve adjustment accrual should also be added to the whole life accruals to account for reserve deficiencies or surpluses. Since the problem of an "open ended" account will not occur within a life cycle curve, it is suggested that an amortization period (AP) technique for the entire life cycle curve be used rather than using a RL remaining life technique with an ELG procedure. The inclusion of remaining life adjustment procedures on an ELG basis adds an unnecessary layer of complication to depreciation systems for the small amount of adjustment that would occur where reserves are closely monitored. For example, the model used in conducting the analysis for this paper provided both the economic and depreciation information.[2]

Reporting

Having recorded the revenues and costs, the general ledger and budget systems can now provide financial reports relating to the firm's performance. Since economic analysis is prospective, financial systems are relied upon to determine whether decisions made using economic criteria are "on track." A method in helping to achieve this tracking is through constructing segmented contribution statements. These statements align themselves with economic principles such as treating equity as a cost and determining a contribution to corporate fixed costs (a cost which is not included within the statement). An additional step is often made, however, to allocate these corporate costs (by using some arbitrary procedure) to help establish the revenue requirements to cover the full costs. Segmentation may be conducted in a number of ways but in order to do product tracking, segmentation must be conducted on a product line basis. In the case of a telecommunication system that has a large amount of joint costs, a cost separation study is required to assign investment related costs to the product lines. This assignment utilizes an incremental costing approach called capacity costing to assign the plant related costs such as maintenance, depreciation, interest, and equity. The assignment of variable expenses are usually assigned by conducting activity based costing studies that assign cash expenses (excluding interest or equity} to product lines. Aside from measuring product line performance on a retrospective and on a prospective basis, contribution statements (shown in Exhibit C) also serve a useful function in the process of establishing prices.

Review

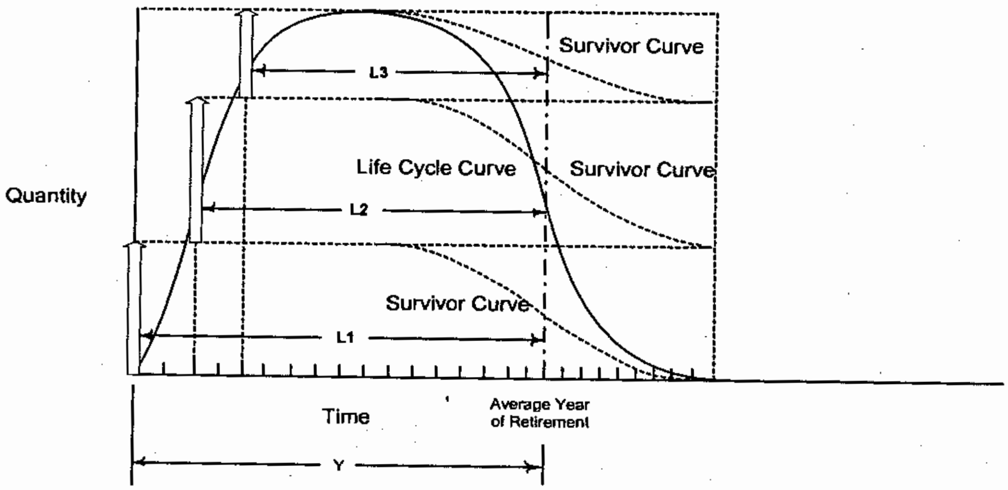
The next step after constructing the financial statements is the process of conducting a variance analysis. Variance analysis compares budget projections with actuals to determine whether corrective action is required. In this step, life cycle parameters must be assessed to see whether they should continue to apply. In Exhibit D, the reporting of actual retirements, for example, shows a change in the life cycle curve. Since each subsequent capital cash flow has a decreasing life with a different survivor curve, traditional (SPR) methods can not be used. Analysis must utilize models such as the Fisher-Pry to determine whether changes to life cycle parameters should be made. Additional techniques should be employed to better assess whether a curve change is required. These should include techniques such as surveillance, projective, normative, and integrative.[3]

Conclusion

The life cycle planning process supplements management's planning process of setting objectives, defining strategies, developing schedules and making evaluations. It is also a cyclic process requiring feedback to change and improve. It helps set objectives and develop strategies by ensuring recommendations are based on sound economic principles. It ensures schedules are met through proper recording and financial reporting and it enables evaluations to be based on a thorough financial review. And it can also lay claim to the famous saying:

> *"If you don't know where you want to go" said the Cheshire Cat, "any road will get you there."*

Exhibit A



The Economic Study life cycle parameters for the above example would be represented by the following information:

Capital Expenditure	Life	Survivor Curve
A	L1	S4
B	L2	S3
C	L3	S2

The relationship of the survivor curve used and life for each of the capital expenditure cash flows can be determined from the following table:

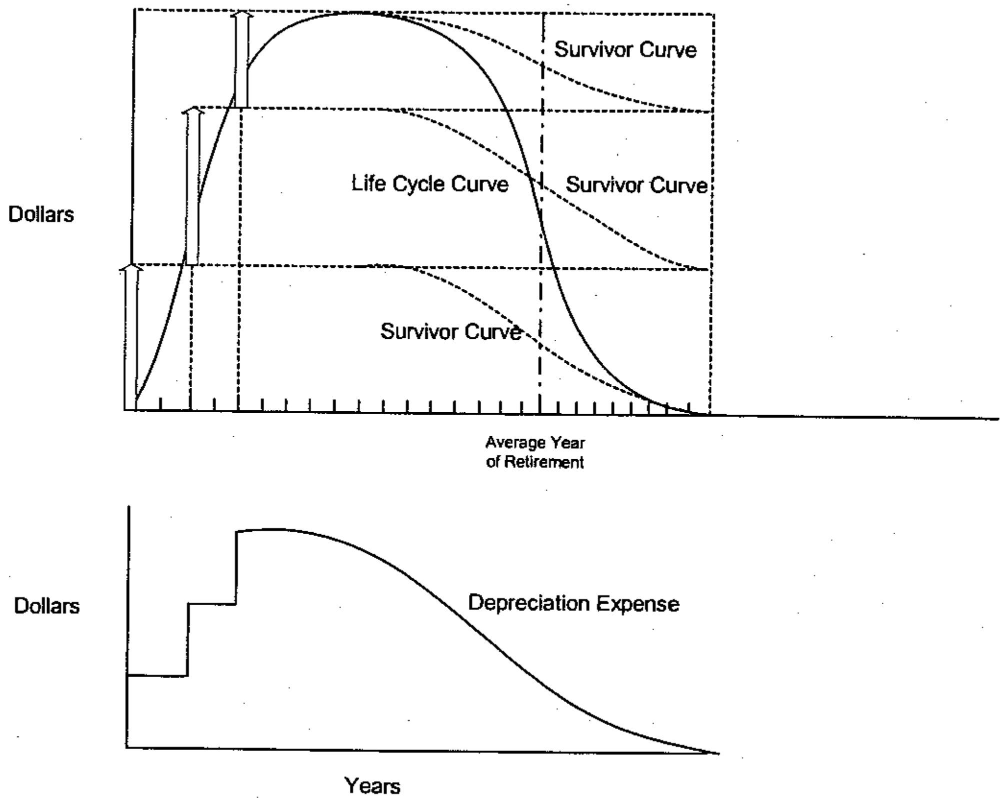
Iowa Survivor Curve for the Initial Cash Flow	Iowa Survivor Curve for Subsequent Capital Expenditure Cash Flows as a percent of L / Y 0%-20%	21%-40%	41%-60%	61%-80%	81%-100%	Unitized Variance
S0					S0	.222359
S1				S0	S1	.150222
S2			S0	S1	S2	.096152
S3			S1	S2	S3	.059513
S4		S0	S2	S3	S4	.030136
S5		S2	S4	S4	S5	.013943
S6	S1	S3	S5	S5	S6	.005672

Subsequent survivor curves are derived from the following formula employing a unitized variance (shown on the right) which relates to each of the Iowa survivor curve:[4]

Subsequent unitized variance = initial unitized variance (Y/L)^2.

Unitized variances were obtained for each of the curves from the text Depreciation Systems by Franklin K. Wolf and W. Chester Fitch

Exhibit B



The above depreciation accruals is the result of applying the depreciation system (SL, ELG, WL)

where: SL = Straight Line method
ELG = Equal Life Group procedure
WL = Whole Life technique

It is suggested that a reserve adjustment using the entire life cycle curve as one broad group would use the depreciation system (SL, BG, AP)

where: SL = Straight Line method
BG = Broad Group procedure for the entire life cycle curve
AP = Amortization Period technique (i.e. 5 years)

This depreciation system would be used to determine reserve deficiencies or surpluses to obtain the following accruals:

Depreciation Reserve Accruals = (TR-AR)/ AP
where: TR = the theoretical reserve
AR = the actual reserve or accumulated depreciation

The total depreciation accruals would be the sum of the two systems.

Exhibit C

Segmented Contribution Statement
($ thousands)

Operating revenue	Product Line A	Product Line B
Revenues	6,000	10,000
Operating expenses		
Direct expenses	800	1,600
Plant related expenses	1,600	3,200
Variable expenses	186	372
Depreciation	843	1,686
Interest	758	1,516
Taxes	97	194
Equity	1,416	2,832
Total Operating Expenses	5,700	11,400
Contribution	300	(1,400)
Fixed expenses	250	500
Net Income	1,466	932
Annual Full Cost Recovery	5,950	11,900
Monthly Full Cost Recovery	496	992

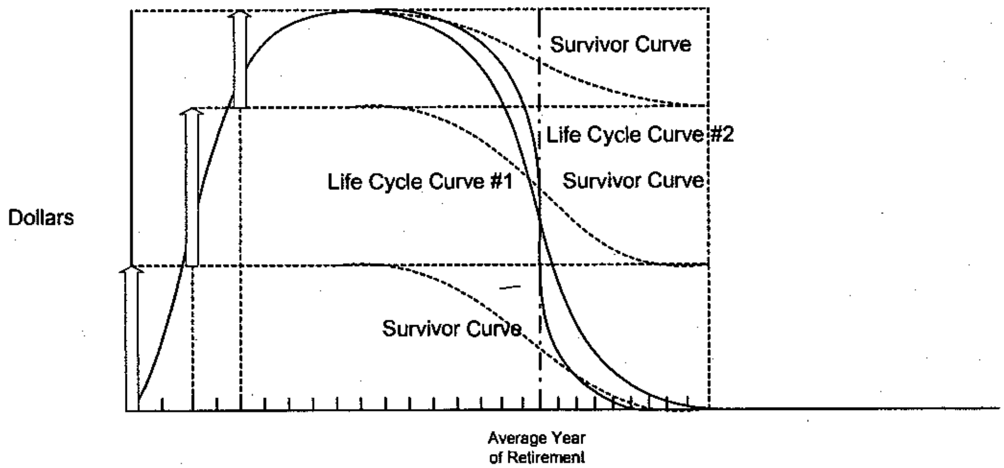
Segmented contribution statements incorporate economic principles within an accounting statement by determining the "drivers" that cause the costs to occur. Direct expenses would be assigned to product lines by using drivers such as service orders. Variable expenses would rely on activity based studies showing the amount of time spent on each product line. Cost separation studies would assign plant related expenses such as maintenance, depreciation, interest, and equity.

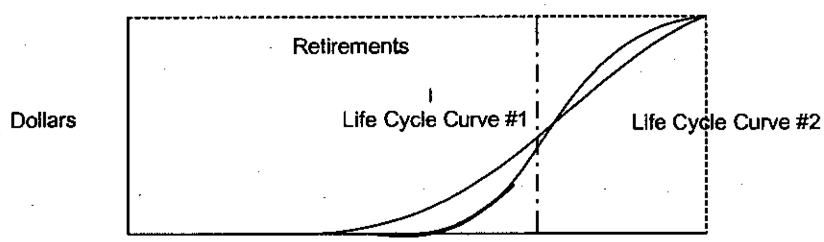
Since equity costs on a total company basis is equal to the net income, (because fixed expenses are included at that point), these reflect the actual and not a objective return to the shareholders. Full cost recovery, however, reflects an objective equity return and hence will use a different equity cost. The above example assumes them to be equal.

Fixed expenses are usually allocated based on total expenses excluding equity.
Net Income can therefore be determined for each of the product lines.

Contribution statements and their corresponding net investment statements are useful in determining life cycle parameters such as maintenance, gross salvage, and removal cost factors used in economic and depreciation studies. The review step assesses these factors to determine whether a change in these parameters should be made.

Exhibit D





Actual retirements (shown as a dark line) indicate a change in the life cycle curve #1 to the life cycle curve #2. The life estimates and survivor curves that made up the life cycle curve #1 can be adjusted through using the Fisher-Pry model to establish the new life cycle curve #2. The life estimate and the survivor curve for the initial capital expenditure may be related to the slope of a Linearized Fisher-Pry model through using the formula V= 0.6956/((b*L/2)^2) discussed in the Willis paper reference 4 below.

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[1] Don Bjerke P.Eng. is a Management Consultant who has spent the early part of year 2000 on an assignment in Buenos Aires Argentina providing consulting services to the Nortel Professional Services Group on Life Cycle Planning. He may be reached at bjerke@sk.sympatico.ca

[2] The model used in conducting analysis for this paper is the Bell Canada's E3 (Engineering Economic valuation) model. This model produces economic & financial indicators and provides pro-forma statements containing depreciation accruals, accumulated depreciation, and retirements. One set of life cycle parameters are used in producing both economic and financial information.

[3] See Technology Forecasting (An Aid to Effective Technology Management) by John H. Vanston

[4] This relationship was discovered by Ralph Bjerke P.Eng. B.Comm. while developing the NX survivor curves. An article on NX survivor curves is discussed in Volume 6, Number 1, 1994/1995 issue of the Journal of Society of Depreciation Professionals entitled Relationship Between The Fisher-Pry and NX Distribution by Ronald J. Willis of Willis Manufacturing Ltd.

Valuation and Service Life Issues Associated with Technology Changes As Viewed Within the Property Tax Arena

Earl M Robinson CDP

Property taxes are generally based upon the fair market value of business assets. Such fair market value of the property being taxed is typically defined as that value which would be determined between "a willing buyer and a willing seller neither being under compulsion, each having full knowledge of all relevant facts and with equity to both". Methods utilized to define the value of the business assets routinely include various forms of the cost approach, the Income Approach, and the Market Approach.

In developing the valuation of the tax payers' property, various factors as well as approaches to value must be considered. However, depending upon the purpose of the valuation, each of the approaches better measures the applicable value. In general, the goal in developing the property value for ad valorem purposes is to identify the current value of the underlying assets used in the business operation.

Why Cost Based Valuation

One of the best and most desirable approaches to identify the current value of specific business assets is through the development of a depreciated replacement cost. The value set forth via the depreciated replacement cost is focused entirely upon the specific assets being analyzed, as of the valuation or lien date. Furthermore, the application of the appropriate depreciation factors gives proper recognition to the remaining economic value of the currently used assets.

The preparation of a depreciated replacement cost study incorporates the use of the Company's historical cost records and applicable cost indexes from which replacement cost factors are developed to reprice the current asset investments to the replacement cost price level. Also, incorporated into the replacement costs, where appropriate, is the substitution of the existing facilities with applicable replacement technologies. Subsequently, the replacement cost of the assets is depreciated using service life characteristics anticipated to be experienced by the various property classes over their remaining useful lives. In addition to the depreciation deduction for loss in service value caused by physical and functional obsolescence, to the extent that excess operating costs are incurred by the existing facilities versus the costs anticipated in conjunction with the replacement plant, further deductions are made to the depreciated replacement cost.

By comparison, the use of comparable market value transactions are all inclusive in that they reflect not only the value of the assets but can and do include various levels of intangibles. The market price is often the product of the Company's desire to obtain an operating base within the market and further is often driven in a large part by the Company's credit line or ability to finance the property acquisition. Also incorporated into the market price paid by purchasers are various intangible values, not the least of which are the potentially significant but not fully known developmental costs. A "greenfield" development of new facilities may require the developer to obtain various approvals and permits without which the facilities could not operate. Accordingly, the intangible components must be removed from the overall value determination. Therefore, while the market transactions provide a value indicator, such values are routinely given less weight due to their being non-representative of the physical plant asset values in light of the factors influencing the transaction amounts.

With regard to the income approach, the future income stream utilized is based upon assessment of anticipated revenue streams from future demands and markets for services. Such estimates are subject to future variations resulting from the number of entrants into the market, along with the general market growth, as well as the economy as a whole. Again, the income approach to value cannot distinguish between tangible and intangible asset values, and therefore, both are included in the developed value indicator. Because of such factors, less weight is routinely given to the Income indication in correlating the Fair Market Value of specific business assets.

Cost Based Valuation

Using the Cost Approach, values can be determined either on a nominal historical value basis or on a current dollar basis (eg. Reproduction Cost, Replacement Cost) at the applicable valuation or lien date. The use of historic book cost, while typically readily available, is often questionable for several reasons. First, the assets per the Balance Sheet, are strictly an accumulation of dollars spent over a period of years. This accumulation of expenditures provides little information about the real worth of the property to the current owner or a potential buyer. The historical net book approach (Original Cost Less Accumulated Book Depreciation) has routinely been previously used as a basis for the valuation of regulated utilities in as much as utilities' revenues in the past have been based upon the return of and return on their original cost investment. However, in more recent years, as a result of changing regulatory structure and practices, especially in the telecommunications industry and now for a portion of the electric industry, utilities have become more competitive and risky, with the result that the assurance of full recovery of their embedded investment will become less likely. Under such a scenario, the historic book cost is no longer necessarily the most valid basis for the valuation of even regulated utilities. Other fixed capital intensive non-regulated businesses have absolutely no assurance of the recovery of their property investment, thus, there is little rational basis for developing cost-based valuations on historical net book cost.

An initial step in preparing a cost-based valuation of the tax payers property, is to review the historical accounting costs to identify whether the dollars were booked at original first cost or are the product of accounting write ups or write downs. Irrespective of the cost-based methodology used, information relative to when the assets were acquired and for what amounts are important, inasmuch as, this information will be utilized as the basis for the property valuation using an indexing methodology.

Replacement Versus Reproduction Cost

The Reproduction Cost of physical assets is the gross cost of the company's embedded (existing) assets stated at today's price level, which the company would be required to expend to build like facilities. That is, the current construction cost is based upon the same facilities as those currently being utilized. In prior periods, this method of valuation was sometimes utilized to determine the fair value for rate base regulated public utilities where regulation allowed for fair market considerations. However, this approach is not applicable to define the true cost based valuation of assets in a competitive environment. The approach is inadequate because it does not give consideration to plant changes required for the business to remain competitive and/or routine ongoing changes caused by technological changes.

By comparison, the use of the Replacement Cost approach seeks to identify, from a cost basis concept, the value of the tangible assets of the going concern giving consideration to changes within the business world. It is widely recognized that there is no certainty that a company's current assets will remain competitive. Such assets could increase in value but more likely, due to advancements in the business world, (especially technical advances) newer generation replacement assets often provide additional capacity, features, lower operational and maintenance cost, etc., at a lower cost than that of the property currently in service. This is especially true in technologically driven entities, such as the communication business (eg. the wireless industry), the computer industry, and other electronics-based industries. With increased modernization due to competitive forces, industries may have a mixture of increasing and declining priced assets. The bottom line is that the development of the Replacement Cost approach not only prices the entities capacity at current price levels, but also gives consideration to the cost of current technology.

For example, the cost of Wireless Industry Base Station Radio equipment continues to decrease on a capacity basis not withstanding the fact of ongoing increasing features and capabilities. Also, the overall footprint requirements are declining with the result that less space, power, etc. are required to house and operate the facilities. Illustrations of such price declines are as follows:

Ericsson

Model	Price Per Voice Path
882	$10,693
882D	7,993
884	5,252

Lucent

Model	Price Per Voice Path
Series I	$16,662
Series II	7,692
Series III	5,682

Likewise, the remaining segments of the communication industry as well as other capital intensive industries are experiencing various price level changes as result of rapidly changing technology.

Also, in preparing the net replacement cost appraisal for existing operating property, deductions must be made for loss in service value attributable to accrued depreciation. The accrued depreciation deduction recognizes that a buyer would be unwilling to pay for property whose income producing capability has been impacted by physical, functional, and economic factors. This is even more critical in circumstances where rapid changes in technology is causing existing property to become obsolete at an ever increasing rate.

Cost Study Approach

A cost study for an operating entity can be prepared using either a unit cost or a trending method. Utilizing the unit cost method to prepare a mass replacement cost appraisal is both time consuming and quite expensive because the performance of such as a study requires that a detailed inventory be completed for all assets subsequent to which the assets are then priced out at today's price level. Given the large quantities and diversity of assets utilized by capital intensive industries, one can easily recognize the magnitude of such a task.

More typically, the process used in preparing a valuation cost study is to develop indexes and related trend factors (translators) through the use of pricing models. Indexes are a set of numerical numbers that relate the price of assets from one period to another. The indexes utilized for repricing assets can be either standard or custom indexes. Examples of standard published indexes include government indexes such as Bureau of Labor Statistics (BLS), Consumer Price Index – Urban (CPIU), Implicit Price Deflators, Handy Whitman Construction Cost Indexes, C.A. Turner Telephone Plant Index, etc. Additionally, various construction appraisal publications exist, such as Boeckh, Marshall Swift, and Means, which can readily be incorporated into indexes.

The development of custom indexes incorporates industry or company specific data and will include cost components relative to the cost of material, labor, and overheads required to construct the property being appraised. The indexes can be developed for individual property items but are more commonly developed for each asset account or property category. Asset account-level or property group level investments are routinely the basis for building a custom index because they are viewed as groupings of homogeneous property and therefore provide a summary of the accounting information necessary for ultimate index application.

Cost Study Research

Exhibit 1 provides a graphic representation of the process required to produce a custom account level cost index. The first step in developing cost indexes is to research the account content of each of the property classes being appraised. *(see Exhibit 1 on following page)*

Assuming that a mass appraisal is being prepared for an operating entity which utilizes a variety of different asset classes, detailed information would be gathered for each of the property accounts or groups. As previously indicated, this would include identification of the account content, plus the range of years in which original installations were completed. Further, the account content needs to be analyzed to identify the percentage of material, labor, and overhead that was utilized in completing the construction. A list of major material vendors, along with major material types, classes of company, and/or contract labor must also be identified.

In developing the applicable indexes, general asset investments, such as vehicles, furniture and fixtures, etc., are routinely repriced to the applicable price level using standard government-type indexes for such material because prices for these products are more or less uniform across most regions of the nation. By comparison, unique or industry-specific assets require custom indexes which include the combination of various component indexes. Depending upon the industry, and more specifically the category of property being reviewed, some of the component cost trends may be decreasing while others are increasing.

Component weighting factors need to be developed for each asset group for which a custom index is required. This step is accomplished by analyzing the company's historical books and records to obtain the percentage of total construction cost which was attributable to each construction cost component. The delineation of items, such as material, labor, transportation overheads, and benefits are normally completed, inasmuch as these categories routinely demonstrate different cost trends. For example, factors such as natural disasters and business climate changes cause building material and/or commodity prices to fluctuate with demand, while technological

Developing a Custom Index

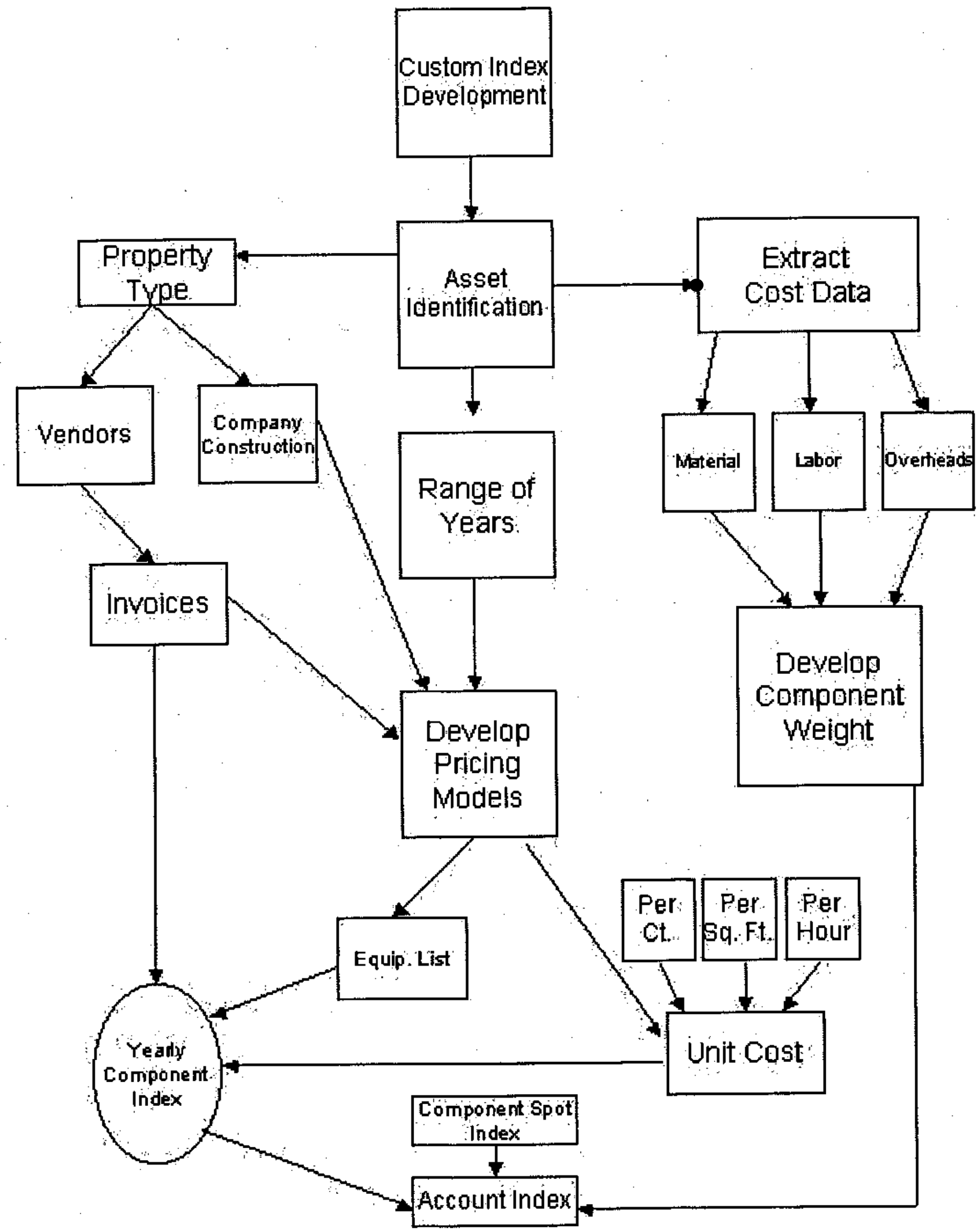

Exhibit 1

enhancements often cause price reductions for such material components of the property group. By comparison, labor costs have routinely increased over time at various growth levels. The identification and tracking of individual cost components afford a better representation of the overall asset costs. In the process of developing and/or identifying cost components, information can be identified as to the primary vendors or sources for each of the principal components.

Once sources and general models are developed, research can be completed from historical company records (additional information can be obtained from vendor catalogs and other related sources) to identify the component pricing for each vintage year. Modifications to the models are sometimes implemented during the process of gathering historical records as sources of detailed information are identified.

The development of the pricing models utilized to reprice various assets can take any of a number of forms, such as a proxy list of equipment utilized to construct the assets contained in the property group. Other approaches may include the use of unit cost, such as cost per radio channel, per port, per line, per circuit, per square foot for materials, per percent for overheads or effective hourly rate for labor costs. Inasmuch as custom indexes are being produced, the models need to be designed and continually reviewed on an individual account or property category basis. Also, the models should be reviewed and reassessed if the property valuation is updated in future years.

Cost Index Weighting

Subsequent to gathering all the detailed source data and development of component indexes, property groups or account indexes are developed via a weighting process as shown on Table 1.

Table 1

Developing a Custom Index for a Property Account

Property Category

Year	Input Index	Weighted Factor	Input Index	Weighted Factor	Input Index	Weighted Factor	Input Index	Weighted Factor	Input Index	Weighted Factor	Input Index	Weighted Factor	Input Index	Weighted Factor	Total Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1983	185.0	92.50	114.3	26.29	62.8	9.42	53.0	2.65	67.7	4.74	0.0	0.00	0.0	0.00	135.6
1984	178.3	89.15	112.1	25.78	65.8	9.87	58.2	2.91	72.9	5.10	0.0	0.00	0.0	0.00	132.8
1985	165.3	82.65	110.0	25.30	68.9	10.34	68.3	3.42	76.9	5.38	0.0	0.00	0.0	0.00	127.1
1986	153.1	76.55	108.9	25.05	75.7	11.36	75.7	3.79	82.9	5.80	0.0	0.00	0.0	0.00	122.6
1987	141.5	70.75	107.9	24.82	82.7	12.41	84.1	4.21	87.8	6.15	0.0	0.00	0.0	0.00	118.3
1988	132.6	66.30	105.7	24.31	88.1	13.22	90.2	4.51	93.2	6.52	0.0	0.00	0.0	0.00	114.9
1989	122.7	61.35	104.3	23.99	92.3	13.85	91.5	4.58	96.1	6.73	0.0	0.00	0.0	0.00	110.5
1990	108.4	54.20	101.7	23.39	98.4	14.76	97.8	4.89	98.4	6.89	0.0	0.00	0.0	0.00	104.1
1991	100.0	50.00	100.0	23.00	100.0	15.00	100.0	5.00	100.0	7.00	0.0	0.00	0.0	0.00	100.0
1992	92.8	46.40	99.6	22.91	105.9	15.89	106.0	5.30	103.5	7.25	0.0	0.00	0.0	0.00	97.8
1993	84.6	42.30	98.6	22.68	109.3	16.40	112.6	5.63	106.8	7.48	0.0	0.00	0.0	0.00	94.5
1994	69.3	34.65	96.4	22.17	111.1	16.67	118.0	5.90	109.3	7.65	0.0	0.00	0.0	0.00	87.0
1995	58.2	29.10	95.0	21.85	114.2	17.13	121.5	6.08	112.9	7.90	0.0	0.00	0.0	0.00	82.1
1996	41.8	20.90	94.5	21.74	117.8	17.67	125.1	6.26	115.0	8.05	0.0	0.00	0.0	0.00	74.6
1997	37.4	18.70	93.1	21.41	119.3	17.90	127.3	6.37	116.0	8.12	0.0	0.00	0.0	0.00	72.5
1998	33.2	16.60	90.6	20.84	122.4	18.36	130.0	6.50	117.9	8.25	0.0	0.00	0.0	0.00	70.6
1999	27.6	13.80	85.4	19.64	130.0	19.50	132.6	6.63	119.2	8.34	0.0	0.00	0.0	0.00	67.9
12-99	24.3	12.15	80.6	18.54	131.7	19.76	133.4	6.67	120.1	8.41	0.0	0.00	0.0	0.00	65.5

Column 3 is 50 % of Input Index - Material 1

Column 5 is 23 % of Input Index - Material 2

Column 7 is 15 % of Input Index - Labor 1

Column 9 is 5 % of Input Index - Labor 2

Column 11 is 7 % of Input Index - Overhead

The weightings utilized to develop the account index are based upon the component percentages identified during the detailed account analysis and, therefore, are a proxy for the actual property construction costs. For example, Column 3 of Table 1 is a 50 percent weighting of the input Material Index (Matindx1) contained in Column 2 of the table, while Column 5 is a 23 percent weighting of the Matindx2 input index contained in Column 4. Likewise, Column 7 of Table 1 is a 15 percent weighting of the Labor1 input index contained in Column 6, etc. The total account index (Column 16) is the sum of the various component index weighting columns. The development of the detailed account index demonstrates that a property which cost $100 to construct during 1991 cost $135.60 to build during 1983, while it cost only $65.50 to construct as of December 31, 1999. It should be noted that for this property class, while labor costs and overheads have been increasing, the dramatic decline of material component costs have resulted in an overall construction cost decline for the applicable property group. Various other property categories will likely experience an increasing price trend, however, in most technologically advancing industries the aggregate replacement cost of all assets often results in overall valuations that are lower than original cost. In developing the composite index, each of the component indexes being weighted together must be consolidated using the same base year from which the component weightings were determined. The base year for an index is changed by simply dividing each vintage year's index by the index of the desired base year. Similar to the models, the component weightings should be reviewed in future years to evaluate their continuing appropriateness.

Valuation Development

The composite indexes developed as the representative cost trend for assets contained in each property account are utilized to reprice the account's historical cost. An attached diagram (Exhibit 2) shows the flow of data utilized in developing the account level composite index, translators, and the resulting vintage level replacement cost for each asset account. *(see Exhibit 2 on following page)*

The translator or trend factor development process is completed by dividing the current index (the vintage price level at which the valuation is to be developed) by each vintage year's index to develop the annual trend factor or translator for the vintage. The indexes developed, per Table 1, are utilized as input (Column 3) to the development of the replacement cost as shown on Table 2. *(see Table 2 on following pages)*

To apply the developed index to the company's historical property, investment translators need to be developed for each vintage year. The vintage translator or trend factor as of 12-31-99 is developed, for example, by dividing the 12-31-99 index of 65.5 by the index for the year's investment (eg. 1991 of 100.0) that one desires to reprice to the 12-31-99 price level. The result of this calculation is a translator of 0.655 that is applied to the company's 1991 historical investment. The translator is developed using the same process for all other vintages. Subsequently, each vintage year's historical original cost is multiplied by the applicable trend factor (translator) to produce the replacement/reproduction cost for each vintage which is summed to determine the total replacement/reproduction cost for the category of property.

Technological Impacts

For example, within the Wireless Industry, the technology has evolved rapidly over a short period of time. The evolution is driven both by the rapidly changing electronics capabilities as well as by the explosive growth of customers. The rapid customer growth has caused the industry to continuously seek ways to increase the operating capacity within the limited available radio spectrum. In a relatively short period of time, the wireless technology has progressed from AMPS, NAMPS, TDMA, CDMA, and G-3 platforms. The continual development of newer operating platforms and standards will sustain rapid technology changes in future years. Recently for example, the industry has added the use of PCS, which incorporates new technology standards and operates an entirely new operating platform. While a sizeable quantity of analog based wireless radios remain in service, the continued addition of new features, such as voice mail, etc., with newer digital phones are rapidly driving customers away from analog systems at record rates. This activity will serve to further erode the usefulness and the value of older embedded technology remaining in the Wireless Industry networks.

In addition, within the Wire-line segment of the Communications Industry, namely both the local exchange and inter-exchange facilities are experiencing dramatic changes. Most noticeably, the communications industry is moving from circuit based to packet based technology. As a direct result

Development of Composite Account Index and Translators

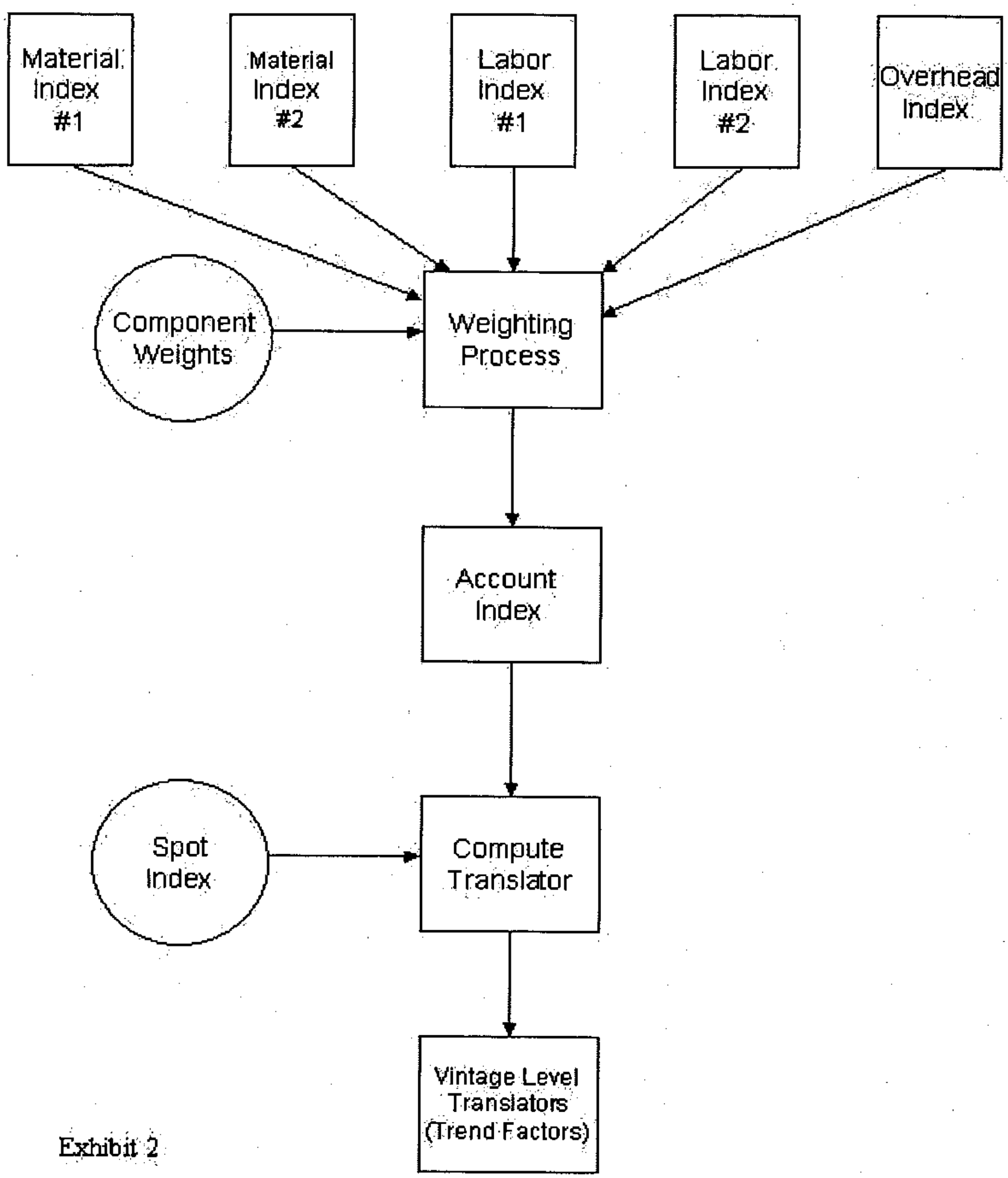

Exhibit 2

of dramatic growth in internet usage, in recent years both the local and inter-exchange markets have experienced explosive growth in demand for bandwidth capacity which is being addressed via rapidly changing technologies. The changing technologies routinely provide increased capacity/capability at lower price levels than under current technologies. Accordingly, the changing technologies are rapidly supplanting the existing technologies in as much as the newer technologies routinely provide expanded capacities/capabilities at equal or lower cost.

Other capital intensive industries are, likewise, experiencing various levels of ongoing changes of technology within their industry, as well as changes with the business environment in which they operate.

Table 2

Incorporating a Cost Index Into the Valuation Study

Replacement Cost of Plant in Service as of December 31, 1999

Property Category

Year	Original Cost ($)	Index 1991=100	Translator 12-31-99	Replacement Cost ($)
1983	395,776.16	135.6	0.483	191,159.89
1984	1,493,917.11	132.8	0.494	737,995.05
1985	1,544,615.05	127.1	0.516	797,021.37
1986	795,860.57	122.5	0.535	425,785.40
1987	1,910,091.08	118.3	0.554	1,058,190.46
1988	4,166,370.61	114.9	0.570	2,374,831.25
1989	3,958,361.53	110.5	0.593	2,347,308.39
1990	2,024,649.29	104.1	0.630	1,275,529.05
1991	2,855,121.09	100.0	0.656	1,872,959.44
1992	3,608,793.33	97.7	0.671	2,421,500.32
1993	8,300,296.94	94.5	0.694	5,760,406.08
1994	14,268,198.31	87.0	0.754	10,758,221.53
1995	26,995,317.94	82.1	0.799	21,569,259.03
1996	25,921,264.74	74.6	0.879	22,784,791.71
1997	26,057,441.54	72.5	0.904	23,555,927.15
1998	32,643,557.26	70.6	0.929	30,325,864.69
1999	37,376,401.35	67.9	0.966	36,105,603.70
12-31-99		65.6	1.000	
Total	194,316,033.90			164,362,354.51

Depreciation Overview

The depreciation of assets can be viewed from several perspectives, namely as an annual charge or as a cumulative deduction in determining the unrecovered cost or net valuation of property. From an accounting perspective, depreciation is viewed as a systematic allocation of the cost over a rational period of time generally associated with the useful life of the property. The allocation of cost of the asset is typically based upon an age/useful life relationship.

By comparison, from a valuation perspective, depreciation is viewed as the cumulative loss of service value of the asset in its ability to produce an income stream for the business entity. In this context, service value maybe defined as the value of the property's contribution to the prices charged for services or products sold to customers.

This loss in service value can be measured by utilizing an age life concept in which depreciation is principally being driven by physical and functional, as well as related economic factors. The historically driven life analysis results will measure some economic factors to the extent that portions of past plant changes have been caused by economic considerations. Further, to the extent that the asset's effective price level has historically been declining over time, a portion of the asset's decline in value is also captured through the application of the replacement cost index. Other economic considerations, such as pending price declines, declines of operating and maintenance costs, may not be captured via standard age life calculations. In such cases, the economic influence must be defined via specific calculations as they are identified through detailed analysis.

The preparation of depreciation deductions for groups of plant using standard age life calculations can be performed via the use of standard generalized survivor curves such as the Iowa family of curves or through the use of expectancy life factors developed via economic remaining life studies. The survival characteristics defined via the Iowa curves (which are widely utilized and accepted throughout capital intensive industries) define the frequency with which property is replaced, as well as the loss of property value on an age/life basis. For example, the Iowa curves include O (Origin), L (Left), S (Symmetrical), and R (Right) mode dispersions. Such dispersions define the pattern of survival and related loss of value dependent upon the manner in which property lives throughout its life.

Other survivor characteristics utilized in calculating age life depreciation may include methods, such as H Curves, Gompertz Makeham, Polynomials, and Negative Expoentials. Any number of statistical type calculations can be used, however, the Iowa curves are widely utilized because they are readily identifiable by many depreciation professionals. The bottom line is that the generalized curves can be utilized to smooth and extrapolate property survivors to maximum life (zero percent surviving) as well as to calculate the loss in service value over the life of the property.

Depreciation Analysis

To enable the calculation of the depreciated replacement cost relative to a group of assets, both the age of the property, as well as the useful service life of the assets must be known. The process of identifying the useful life of asset categories is completed via a detailed depreciation analysis of the asset investments. The analysis of the investments can be completed via a number of different approaches that give consideration to both historical, as well as prospective factors. Two of the more common methods for analyzing a company's historical financial data are the Retirement Rate Method (an actuarial procedure) and the Simulated Plant Record Method (a semi-actuarial procedure). In addition, there are substitution procedures that utilize recent historical trends with regard to the substitution of one technology for another to project the survival characteristics and remaining useful life.

The Retirement Rate Method utilizes observed retirements by vintage together with the ages of the retired property to define the useful life being achieved by the asset investments. By comparison, the Simulated Plant Record Method utilizes additions by vintage along with un-aged cost information relative to property retirements and balances to statistically extrapolate data (aged retirements) for the purpose of identifying life characteristics and useful property lives. The key difference between the two approaches is the use of aged versus unaged data.

Either of these methods can be utilized to analyze historical records of homogeneous groups of asset investments depending upon the level of specific information which can be obtained from the company's property records. The use of the Retirement Rate Method is generally deemed a more desirable approach as more specific information is known about the property data base.

In the actuarial or Retirement Rate Method, the company's historical property investments and past retirements are stratified into age intervals. In other words, the actuarial analysis identifies, at each age level, how many plant in service investments were exposed to retirement and how many retirements occurred. From this data base an observed life table is developed which shows what percent of the original property placed into service continues to provide service at each succeeding age interval. The information contained on the accompanying Table 3 shows the development of an "Observed Life Table." *(see Table 3 on following page)*

Column 2 of the table summarizes the investments which have been in service during each of the age intervals listed as Column 1 on the table. Column 3 contains the retirements which have occurred during the age interval. The percent surviving or "observed life table" (Column 5) is developed by the successive multiplication of each age interval's survival ratio (1 minus the retirement ratio). Utilizing the previously described standard (Iowa) curves, the resulting observed life table is fitted, smoothed and extrapolated to age zero to enable the calculation of an average service life.

The "Observed Life Table" (historic experience) results are plotted on a graph showing the percent of property surviving at each of the age intervals along with applicable smooth curve fittings. The curve fittings are completed via computer processing using statistical applications, as well as visually via manual or computer overlays.

Table 3

Observed Life Table

Property Category

Age Interval	$ Surviving at Beginning of Age Interval	$ Retired During Age Interval	Retirement Ratio	% Surviving at Beginning of Age Interval
0.0 - 0.5	126,134,413	46,215	0.00037	100.00%
0.5 - 1.5	119,699,943	837,933	0.00700	99.96%
1.5 - 2.5	111,330,648	2,780,131	0.02497	99.26%
2.5 - 3.5	107,648,849	6,687,564	0.06212	96.78%
3.5 - 4.5	99,736,649	8,193,589	0.08215	90.77%
4.5 - 5.5	83,880,668	21,511,443	0.25645	83.32%
5.5 - 6.5	66,313,296	23,789,031	0.35874	61.95%
6.5 - 7.5	46,979,829	14,426,513	0.30708	39.73%
7.5 - 8.5	41,287,221	10,014,411	0.24255	27.53%
8.5 - 9.5	43,633,454	19,713,035	0.45179	20.85%
9.5 - 10.5	32,275,944	11,676,914	0.36178	11.43%
10.5 - 11.5	31,169,191	8,350,173	0.26790	7.29%
11.5 - 12.5	22,667,126	5,770,482	0.25457	5.34%
12.5 - 13.5	16,394,196	6,487,890	0.39574	3.98%
13.5 - 14.5	13,374,846	5,165,149	0.38618	2.41%
14.5 - 15.5	9,552,348	2,131,702	0.22316	1.48%
15.5 - 16.5	6,364,835	3,475,012	0.54597	1.15%
16.5 - 17.5	4,140,205	1,319,717	0.31876	0.52%
17.5 - 18.5	2,629,632	917,065	0.34874	0.35%
18.5 - 19.5	1,075,236	491,643	0.45724	0.23%
19.5 - 20.5	555,358	173,203	0.31188	0.13%
20.5 - 21.5	153,233	4,603	0.03004	0.09%
Total	986,997,120	153,963,418		

This process enables the depreciation professional to identify the historic service life which is currently being achieved by the property group and provides an initial basis from which assessments can be made relative to the future life of the property group. Studies are completed relative to various bands of years over the account's history to identify trends and/or to identify changes in achieved service lives during various periods. Useful service lives of property are not static and must continue to be reviewed on a regular basis. The useful lives are affected by many factors such as changes in competition, technology, management, economic conditions, government regulations, etc.

In circumstances where the company can not identify the age of annual retirements, the Simulated Plant Record method is an alternative approach which is typically utilized to complete the life analysis of the company's property. The application of this method incorporates the use of the company's annual gross additions together with standard (Iowa) survival characteristics to compute annual simulated survivors and/or retirements. The annual simulated activity is statistically compared to the account's annual aggregate booked accounting activity via the least squares or the other fitting procedures. The study process is completed based upon the historical depreciation data base using various lives and curves until the best fits are identified via various goodness of fit criteria, such as a conformance index, index of variation, and/or retirement experience index. The resulting service life characteristics are used to develop surviving investments and subsequently the expectancy life factor (condition percent) of the surviving assets.

Another method which is routinely utilized together with the actuarial procedure is the life span/forecast method. This approach is often utilized for asset categories whose future life will be truncated en masse as opposed to being replaced on an individual unit by unit basis over a period of time. An example of such a property to be analyzed in this manner might be an asset group that is being replaced en masse with a new technology, or any other property group that may have been constructed either all at once or over time but which would be removed from service all at one time. Inasmuch as these properties would experience little or no retirement dispersion, this procedure compensates for the property life truncation and its impact on the overall life of the facility.

In the past, service life analysis has been prepared in a large part based upon historical data. However, as previously noted, in more recent years combination historical/prospective methods, such as life cycle analysis and substitution analysis have come to the forefront. Such methods seek to identify and measure the anticipated useful life based upon the rate of property substitution during the early segment of the property's replacement. These methods along with qualitative assessments by depreciation professionals are additional tools which assist in providing a rational estimate of a property's service life.

Prospective factors which need to be incorporated into the life analysis include items such as the company's future capital budgets, information related to evolving technologies, required upgrades, competitive forces and anticipated future consolidations, as well as the specific identification of any impaired assets. Knowledge of these and other factors will enable the professional to better assess future forces of retirement or loss of value affecting the property class. The bottom line in the analysis phase of a service life study is to appropriately weight the company's and/or the industry's historical experience together with changing factors affecting prospective operations to arrive at an appropriate service life for the property group. The service life parameters are utilized to both define the economic remaining life and depreciated values relative to the current surviving assets in service.

Depreciation Application

The goal of the study is to define the economic useful life of the property group to enable the determination of the fair market value of the business assets via the cost approach, which tax assessors can then utilize to develop the owner's tax obligation. The completion of this task involves developing and applying resulting depreciation factors identified in studying the company's property to the known and quantifiable investments obtained from the company's accounting records.

In order to develop the remaining life for a company's property, detailed accounting information is required relative to the company's assets. Most, if not all, of the data required to calculated the desired values will have been developed during the data collection process when preparing the replacement cost indexes and completing the depreciation service life study. The information required to complete the calculations includes the identification of the company's historic cost for each account or property group by original in-service year. Likewise, in order to complete the economic remaining life and theoretical depreciation deduction, the applicable average service life and survival characteristics will have been defined. These factors will have been identified in the service life analysis phase of the property study.

The actual economic remaining life depreciation calculations are completed for each property account by individual vintage. The property's vintage investments are segmented into annual depreciation accruals by dividing the original investment by the average service life of the property. The remaining life of each vintage's investment is developed through the use of the current age and the estimated average service life parameters.

An account's economic remaining life is defined as that portion of the company's property which has not been consumed in providing past service or products to customers. The composite remaining life for each account is developed via the age/life basis by dividing the sum of the future accruals by the sum of the current annual accruals.

An expectancy life factor (percent good) is calculated in the process of developing the depreciation replacement cost of each of the entity's assets. The expectancy life factor is produced by dividing each vintage's remaining life by its average service life. The resulting expectancy life (percent good) factor is multiplied times the applicable replacement cost, as summarized on Table 4, to produce the depreciated replacement cost on a vintage level which is then summed by account and total company to determine the company's total depreciated replacement cost valuation.

Table 4

Depreciated Replacement Cost

Property Category

(Calculated using straight line ELG/ARL group procedure as of December 31, 1999)

Year	Replacement Cost	Expectancy/Life Factor	Depreciated Replacement Cost
1983	191,159.89	0.00000000	0
1984	737,995.05	0.00000000	0
1985	797,021.37	0.00000000	0
1986	425,785.40	0.03571428	15,207
1987	1,058,190.46	0.05396681	57,107
1988	2,374,831.25	0.08314221	197,449
1989	2,347,308.39	0.11499687	269,933
1990	1,275,529.05	0.15128434	192,968
1991	1,872,959.44	0.19335020	362,137
1992	2,421,500.32	0.24243176	587,049
1993	5,760,406.08	0.29981474	1,727,055
1994	10,758,221.53	0.36682745	3,946,411
1995	21,569,259.03	0.44477084	9,593,377
1996	22,784,791.71	0.53489613	12,187,497
1997	23,555,927.15	0.63867222	15,044,516
1998	30,325,864.69	0.75907535	23,019,616
1999	36,105,603.70	0.90553593	32,694,921
Total	164,362,354.51		99,895,243.00

This application of depreciation parameters to a company's replacement cost identifies the current value of the company's assets giving consideration to the physical attributes (such as wear and tear), the property's age, as well as functional obsolescence. Further, the calculation, through the index repricing process, gives consideration to price changes driven by inflation and technological enhancements, reduced manufacturing costs, etc. To the extent that assets have been replaced for competitive or economic causes, the shortened service life also captures portions of the economic obsolescence impact.

Conclusion

In summary, the completion of a replacement cost index, depreciation service life study, and depreciated replacement cost study produces meaningful information which can be utilized as input into the cost valuation process.

Through the development and application of indexes, the study will have produced supporting documentation and a calculation of the replacement cost new of the business's property, as well as a summary and report of the Depreciated Replacement Cost (Fair Market Value) of the company's property for property tax purposes.

Appraising a Utility for Condemnation Purposes

John S Ferguson CDP

Abstract

Utility condemnation proceedings typically involve a condemnor intent upon taking over the operation of some portion of the condemnee's business. Therefore, such proceedings involve the partial taking of a business through a transaction in which one of the parties is being forced to participate. Such takings require careful consideration of appraisal techniques to assure that the condemnee and its remaining customers neither gain nor lose as a result of the transaction. This article discusses an appraisal approach that produces this result.

Available Appraisal Approaches

The electric industry restructuring currently in progress has created a need to determine values for service territory purchase or sale transactions, and for transactions that transfer some portion of the customer service function to another entity. While this discussion addresses condemnations, the appraisal approach presented is not limited to transactions involving condemnation. Appraisals for condemnation purposes typically involve only a portion of the business of the condemnee, and consider (1) that the condemnor's intent is to operate the business being taken, (2) the influence of price regulation, and (3) any severance costs that would be incurred by the condemnee to continue to adequately serve its remaining customers. The taking of a business requires that the appraisal be as a going concern. Regulation is a form of economic obsolescence that is significant to estimating the value of a price-regulated entity, because of the basis regulators utilize to set the allowed level of tariffs.

There are three basic approaches to the determination of value – income, market and cost. For an income producing operation taken through condemnation, the income approach is the most appropriate appraisal choice, as it measures the present worth of anticipated future economic benefits that will be lost as a result of the taking. While the market and cost approaches can be reasonable surrogates for the income approach under certain circumstances, such circumstances are unlikely to apply to a condemnation transaction. Therefore, the market and cost approaches may not be useful.

Fair market value is often put forth as being the appropriate basis for determining the price for acquiring a business through condemnation, and is defined by the American Society of Appraisers as:

> The price, expressed in terms of cash equivalents, at which property would change hands between a hypothetical willing and able buyer and a hypothetical willing and able seller, acting at arm's length in an open and unrestricted market, when neither is under compulsion to buy or sell and when both have reasonable knowledge of the relevant facts.[1]

A condemnation transaction does not meet this definition, because condemnation places one of the parties under a compulsion to sell. Therefore, the fair price for a condemnation is that price that will cause the condemnee and its remaining customers to neither gain nor lose as a consequence of the contemplated transaction. The income approach described herein is devised to assure and to demonstrate that the condemnee and its remaining customers will neither gain nor lose from such a transaction.

The Market Approach

The market approach is unlikely to be useful for a condemnation, because the market for sales of a portion of an entity is thin and because the information needed to determine the transaction comparability is rarely a matter of public record. Without proof of comparability, the market approach is not valid. While the electric industry is currently going through a restructuring that is causing merger transactions, such transactions involve entire entities so are unlikely to be useful for partial takings. Comparability has recently gained increased importance, because the lost revenues may include authorized recovery of stranded generation costs that were not reflected in prior transactions.

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[1] Valuing a Business, Fourth Edition, by Pratt, Reilly and Schweihs

Severance (or incorporation) costs probably would be reflected in utility merger and condemnation transactions, but such costs would be so unique that they would need to be eliminated from comparable transactions and incorporated specifically. Going concern value would also likely be reflected in market transactions and be sufficiently unique to treat separately. The effect of regulation would likely be reflected in market transactions, and not require separate treatment. However, the effects of going concern value and regulation on merger transactions are too different from their effects on a partial taking for the merger market to be of use for condemnation transactions.

The Cost Approach

Cost is a measurement of the expenditures necessary to produce a property similar to that being appraised. The cost approach is sometimes useful for appraisals of utility operations, but such costs apply to only the physical assets. The costs of the physical assets must be adjusted for such factors as going concern value and the economic obsolescence due to regulation, and, for a condemnation transaction, for double taxation and any lost stranded cost recovery. Since consideration of going concern value, the influence of regulation and stranded cost recovery is inherent in the income approach, the most accurate approach to incorporating these considerations into a cost-approach determination of value is to subtract the asset current cost new less depreciation from the value determined by the income approach. While this would assure that the cost approach accurately reflects such considerations, the value would be identical to the income approach value, so applying the cost approach would be redundant.

The current cost new can be determined using either of two basic concepts – reproduction or replacement. The reproduction concept assumes the existing facility would be physically replicated. The replacement concept assumes the existing facility would be functionally replicated. The extent of detail that regulators require be maintained in utility property accounting records facilitates calculating current cost by applying trend factors to original costs recorded by vintage year or by applying current unit costs to a recorded asset inventory. However, property accounting records may not be in sufficient detail to identify the facilities involved in a partial taking, thereby requiring an appraisal-specific physical inventory.

The cost approach requires recognition of the physical deterioration and functional and economic obsolescence (existing depreciation or condition) of the property. There are numerous approaches for estimating the existing depreciation. I am convinced that an observed condition study consisting of both inspection and analysis produces the most accurate estimate of the physical deterioration and functional obsolescence aspects of existing depreciation. However, an observed condition study requires a high level of expertise and is time consuming and expensive. Regulators specify that three physical and five non-physical causes of depreciation be considered by electric utilities for book depreciation accounting purposes, and that four physical and five non-physical causes be considered by gas utilities. Therefore, percent condition calculation techniques based on the elements reflected in book depreciation rates (average life, retirement variation pattern around average life, salvage, and removal or abandonment expenditures) are useful. Economic obsolescence due to regulation is not one of the depreciation causes that is required to be considered for accounting purposes.

The influence of severance costs and stranded cost recovery are unique to each transaction, so would need to be segregated for specific treatment. Dealing with the double taxation issue requires adding the capital gains taxes that would be incurred by the condemnee.

The Income Approach

When dealing with an entire regulated entity, such as for ad valorem tax purposes, regulation often causes the income approach to produce a value that approximates the amount of rate base. Thus, for such a situation, original cost less recorded depreciation (book value) may serve as a reasonable surrogate, because both the revenues and expenses involved reflect average costs. However, when dealing with only a portion of the entity, such as would typically be the case for a condemnation transaction, the income approach produces a value substantially in excess of book value. This excess for a partial sale is due to expense changes that are lower than the average costs that are reflected in the revenue changes of a regulated entity. Therefore, neither the original cost less recorded depreciation nor the current cost less calculated depreciation would provide a reasonable indication of value for a partial taking through condemnation.

The appraisal approach discussed here is to determine the present value of the net income that would be lost by the condemnee as a result of the contemplated transaction. This lost income approach allows adjustment for double taxation and incorporation of stranded cost recovery, and makes quite clear the amount of compensation that would cause the condemnee and its remaining customers to neither gain nor lose as a result of the transaction.

There are two approaches for dealing with the double taxation issue. One approach is to add the capital gains taxes to the present worth of the lost after-tax income. The other approach is to base the value on the present worth of the lost pre-tax income, thereby letting the taxes take care of themselves. The first approach is the most accurate. However, there is judicial precedent for the second approach (lost pre-tax income).

The income approach conducted in this manner reflects normal operations, so does not capture severance costs, which must be added.

Structure of the Income Approach

This discussion covers an income approach that I have found useful for transactions when the acquired entity is to be incorporated into the acquiring entity, and when only a portion of the entity is sold, such as through condemnation.

When dealing with only a portion of an entity, the income approach produces a value much higher than depreciated original cost, due to regulation causing the revenues gained or lost to be based on average costs that include a prorata share of administrative and supervisory expenses that will not be reflected in the expenses gained or saved. In effect, the appraiser would deal with two income statements, one prior the transaction and one after, but can simplify things by considering only the differences between the two statements. This differential income statement approach deals with revenue and expense changes, and has the advantage of demonstrating that a transaction at the resulting value would be fair to all parties, because it is clear that customers and stockholders would neither gain nor lose.

Utility revenues are based on tariffs that have been authorized by a regulator. Regulatory proceedings cause tariffs to reflect average costs that include an allowed return on an earnings base. Utilities price their services to recover the costs incurred to serve each type of customer, so have considerable information on both costs and customer usage characteristics. This information for electric utilities is especially likely to be current, because cost of service studies serve as the basis for the tariff unbundling required for the segregation of the supply function that is being dictated by the industry restructuring currently in progress. Once the tariffs applicable to the customers gained or lost and the customer's usage characteristics are identified, the calculation of revenues gained or lost becomes mechanical.

There may be situations when total customer revenues are not all gained or lost, such as when there is a shift between wholesale and retail service. This would occur when the seller provides supply (production) service to the purchaser, or when the purchaser previously provided supply service to the seller. In such situations, there likely would be no changes to the expenses for the supply service, thereby simplifying the differential income statement. This simplification also occurs when restructuring has separated the supply function from the delivery function.

Determining the expenses incurred or saved takes more effort, but is somewhat simplified by the fact that regulated entities typically utilize quite detailed (cost of service) studies in the process of estimating the costs to serve each type of customer. Which expenses would be gained or saved under the circumstances to be reflected in the appraisal can be derived from these studies, most easily by those familiar with utility accounting, operations and cost of service studies. It is helpful that the Uniform Systems of Accounts specified by regulators include an account code structure that must by used by each type of utility subject to its jurisdiction, and that the code structure varies by type of utility but not by regulator. While the account code structure tends to be standardized, the appraiser needs to recognize that no two entities implement the structure in exactly the same manner.

The differential income statement representing the revenue and expense changes would reflect normal operations, so does not represent the entire value of the operation being appraised. A selling entity would incur severance costs and an acquiring entity would incur incorporation costs that must be considered. Severance costs would be added to the value, and could be for such things as compensation for any resulting over capacity of facilities not sold and assuring the service reliability of remaining delivery system. Incorporation costs would be deducted, and could be for such things as new or higher capacity interconnections, bringing acquired facilities up to the purchaser's standards, and carrying out maintenance that has been deferred by the seller.

Expense changes can be derived from unit costs determined from a cost of service study, which would classify costs as being demand, commodity or customer related, or directly from accounting records. There would also be a general category of costs not specific to the other three categories. Some of the costs tend to follow investment and some follow the number of customers, so unit costs in relation to investment amounts and number of customers will be useful.

The appraisal would need to recognize that a seller would expect compensation for any income taxes generated by the transaction. Value can be determined by capitalizing the net income gained or lost in one year, or by discounting the net income expected to be gained or lost over the remaining economic life of the property or operation being appraised. Dealing with the future allows consideration of business growth. The capitalization or discount rate should be consistent with the rate of return that is reflected in the tariffs used to calculate the revenues gained or lost.

This discussion covers implementation on an income statement basis. A cash flow basis could also be utilized, but is more complex. The cash flow basis involves expenditures for construction of new and replacement facilities and for removal or abandonment of replaced facilities and any salvage proceeds, and income taxes would be based on tax depreciation rather than book depreciation. Handling tax depreciation is very complex, and is beyond the scope of this discussion.

Value for a Purchase or Sale Transaction

The distinction between average costs reflected in revenue changes and incremental costs reflected in expense changes typically causes the value for partial sales and for incorporations to be considerably higher than the book value. How much higher varies inversely with the size of the sold or acquired operation. This relationship is inverse, because a transaction that is small relative to the entity is unlikely to cause any change in executive and administrative costs, and may cause little or no change in operation and maintenance supervision and staffing levels. These costs will start to be saved or incurred as the size of the operation becomes larger. For example, consider a situation with $1,000 of average revenues per customer, a composite income tax rate of 40%, a discount rate of 9%, and a property cost basis for income tax purposes of 50% of original cost less recorded depreciation (net book value). The seller's values per customer shown on Figure 1 could result when dealing with a single customer for which physical facilities are not involved and when dealing with many customers for which physical facilities are involved. Some may be surprised by the magnitude of the Figure 1 relationships between compensation and annual revenues, but any lower compensation would have the effect of unfairly causing a portion of the purchase price to be borne by the remaining customers.

Figure 2 lists the revenue and expense categories that might be reflected when applying my income approach to the condemnation of a portion of an electric utility service territory. This illustration deals only with delivery service, so assumes the supply function has either been separated through restructuring or is not influenced by the transaction. The appraisal process is further simplified when the facilities involved are limited and/or the customers are few enough or small enough for their loss to cause little or no excess capacity or excess capacity that is small enough to ignore. Capacity increases needed by purchasers to serve its newly acquired customers likely would be reflected in incorporation costs, rather than in the value estimate.

The service revenues should reflect any future tariff changes that are already specified as a result of shifting to a competitive market. Stranded costs are collected from delivery service customers, and are segregated on Figure 2 in order to allow specific recognition of their recovery amounts and timing. The revenues for revenue-related taxes are assumed to be exactly offset by expense changes, so are not listed.

Most of the operation and maintenance categories listed on Figure 2 are performed functions that the regulator's account code structure relates to, so would be suitable for a study that utilizes investment and customers as the basis for allocating recorded expenses to the portion of the operations being appraised. The appraiser would match the investment accounts to the expense accounts, and determine which would change as a result of the transaction. The operation and maintenance expense categories, "transmission substations" through "lighting," involve physical delivery facilities, so can be related to the respective investment in these facilities. The categories, "customer accounting" through "sales," involve customer service functions, so can be related to the number of customers. There are fewer of these performed functions than there are operation and maintenance expense categories. For example, the electric utility Uniform System of Accounts specified by the Federal Energy Regulatory Commission includes nine primary (three digit) transmission property accounts and 15 primary transmission operation and maintenance expense accounts, and many utilities further segregate them into sub-accounts. Thus, the operation and maintenance expenses for the transmission substation function represented by property accounts 352 and 353 could include the operation expenses recorded in account 562 and the maintenance expenses recorded in account 570, both increased to recognize that a transaction will cause injuries and damages, and pensions and benefits recorded in administrative and general expense accounts 925 and 926 to change. Supervision and engineering expenses recorded in accounts 560 and 568 may or may not change, depending upon the size of the portion taken relative to the total entity.

More or fewer performed functions than are listed on Figure 2 may be utilized for cost of service studies, but such studies would have already categorized the investment and operation and maintenance expenses into the various functions. Therefore, when relying on cost of service studies rather than building up the expenses from accounting records, the process of determining the expenses applicable to the appraised operation will involve eliminating any that would not change as a result of the transaction. The remaining costs could then be allocated to the operation being appraised, or could be turned into expenses per unit of capacity and energy and number of customers for application to the number of kilowatts, kilowatt-hours and customers inherent in that portion of the operation being taken.

The "other" category of operating and maintenance expenses on Figure 2 could cover revenue sensitive items such as regulatory fees and association and research organization dues.

While the appraisal does not determine reconfiguration costs, construction or removal of facilities causes operation and maintenance expense changes that should be recognized. Transactions involving physical facilities would change depreciation expenses and may change property taxes. Purchaser reimbursement of capitalized reconfiguration costs would be recorded by the seller as a contribution, thereby offsetting construction costs, so would not change depreciation expenses. Whether a reimbursement would influence property taxes depends on the basis for such taxes.

Once the annual Net Pre-Tax Income Lost has been determined, the remaining calculations are mechanical.

When the approach requires that non-direct expenses be added to recorded operation and maintenance expenses, the techniques used in cost of service studies can aid the appraiser in matching investment and expense categories and in identifying and allocating the appropriate non-direct categories. However, the appraiser should be alert for cost of service study techniques that have been selected more for the political correctness of their impact than for their accuracy.

The categories on Figure 2 would be the same for both sales and purchases, except for the transaction taxes. A transaction would likely cause a seller to incur capital gains taxes, but there would be no such tax effect on a purchaser.

Knowledge of the original cost of the facilities involved is needed for this differential income approach to determine operation and maintenance and depreciation expense changes and perhaps to determine property tax changes, but is not a measure of value. The current cost less depreciation is not a measure of value either, but may influence a purchaser's decision to proceed with the transaction. Identifying the facilities involved in a transaction may require an appraisal-specific inventory, the conducting and pricing of which are beyond the scope of this discussion.

Physical facilities probably would not be involved in transactions concerning only the customer service aspect of operations, so the transmission and distribution operation and maintenance expense, depreciation and property tax categories on Figure 2 probably would not change. Three-part tariffs, consisting of separate capacity, energy and customer charges, are commonly utilized for large customers. The capacity and energy charges are combined into an energy charge for the other customers. A cost of service study will identify the customer service costs and disclose whether the customer charges in the tariffs accurately reflect these costs, and, if not, would provide the basis for any modifications needed to match the revenue changes with the expense changes.

As discussed above, there are two approaches to addressing the double taxation issue. Figure 2 shows the after-tax approach. The pre-tax approach would determine the compensation by calculating the present value of the Net Pre-Tax Income Lost rather than of the Net After-Tax Income Lost and would not consider Transaction Taxes.

Conclusion

I have found the differential income approach described herein to be useful for condemnation purposes and for acquisitions. While there may be differences of opinion concerning the magnitude of individual inputs, the logic of utilizing the differences between the two income statements is difficult to refute. However, the approach is not simple to apply, and will be best implemented by appraisers familiar with utility accounting, operations, equipment, cost of service studies and depreciation studies.

Those experienced in applying the cost approach to utility condemnation transactions may be surprised by the magnitude of compensation this income approach indicates is required to keep customers and stockholders from either gaining or losing.

Figure 1

Value per Customer for a Condemnation Transaction Involving an Electric Delivery System

Particulars	One Customer	Many Customers
	$	$
Revenues Lost	1,000	1,000
Expenses Saved	(100)	(550)
Net Pre-Tax Income Lost	900	450
Income Taxes Saved	(360)	(180)
Net After-Tax Income Lost	540	270
Present Value of Net Income Lost	6,000	3,000
Transaction Taxes	4,000	1,333
Compensation Due Seller (a)	10,000	4,333
Net Book Value of Property (a)	0	2,000

Notes:
(a) Excludes severence costs, if any.

Figure 2

Appraisal Components for a Condemnation Transaction
Involving an Electric Delivery System

- Delivery and Customer Service Revenues Lost
  - Service Revenues
  - Stranded Costs

- Expenses Saved
  - Operation and Maintenance
    - Transmission
      - Substations
      - Lines
    - Distribution
      - Substations
      - Lines
      - Line Transformers
      - Services
      - Meters
      - Lighting
    - Customer Accounting
    - Customer Service
    - Sales
    - Property Taxes
    - Other
  - Depreciation

- Net Pre-Tax Income Lost

- Income Taxes Saved

- Net After-Tax Income Lost

- Present Value of Net After-Tax Income Lost

- Transaction Taxes

- Compensation, Excluding Severence Costs

A Retrospective Look at Reserve Ratios
Ralph Bjerke

Abstract

This article illustrates that the reserve ratios for dispersed properties can be severely understated when calculated using the prospective method.

Non-Dispersed Properties

It is generally acknowledged that straight-line depreciation can be calculated by using either the retrospective or the prospective method. The former estimates the aggregate of past accruals whereas the latter estimates the sum of future accruals. For non-dispersed properties these two methods can be proven to be equivalent by comparing similar triangles.

EXPENSE = B/ASL = (B – R)/ARL

Where: B – depreciable plant balance
ASL – average service life
R – theoretical reserve
ARL – average remaining life

Constant Gross Additions with Dispersion

In the special case where the yearly gross additions are always the same, the reserve ratio approaches 50% of the plant balance. This is unaffected by the amount of dispersion provided that ELG (Equal Life Group) calculations are used.

Consider the example shown in Table 13-1 on page 191 of the Public Utility Depreciation Practices issued August 1996. Assuming zero salvage, the reserve ratio can be calculated from the average remaining life by using the formula (1-ARL/ASL) but ELG procedures are not being used and there is a tendency for the reserve ratio to be understated. In this case, as shown in Table 2, the reserve ratio using the prospective method is 0.387.

The theoretical reserve can be calculated by taking the accumulated recoupment (sum of theoretical expenses) less the sum of actual retirements. We will assume the actual retirements are equal to theoretical retirements. The reserve ratio using the retrospective method is the ratio of the theoretical reserve over the remaining plant balance. Therefore the theoretical reserve in this example is 7,500, as shown in Table 1, less the sum of retirements of 5,000, as shown in Table 2, which yields a theoretical reserve of 2,500 and thus a reserve ratio of 0.5.

Linear Growth Rate Accounts

Since constant year to year additions are somewhat unusual, let us examine an example where additions increase over time in a linear fashion. Assume that the initial addition of $100 was made in 1960 with increments of $100 each year until it reaches $4,000 in 1999. All calculations use the mid-year convention. Placing these gross additions in the format shown in Tables 1 and 2 and using Iowa curves with an ASL=10 years resulted in the calculations shown in Table 3.

The unitized variances listed in Table 3 were obtained from Appendix B of Depreciation Systems published by Franklin K. Wolf and W. Chester Fitch. It was observed that the following formula could be used to roughly approximate the average remaining life of linear growth rate accounts.

ARL = 0.5 ASL (1 + V)

Where: ARL – average remaining life
ASL – average service life
V – unitized variance

The life expectancy of surviving group of physical assets at a given age is equal to the area under the survivor curve to the right of that age, divided by the survivors.

The composite average remaining life for a group of vintages is computed by direct weighting as per Standard Practice U-4 published by the California Public Utilities Commission in January 1961.

The Negative Exponential Curve

The average remaining life for a negative exponential curve is simply equal to the average service life and this remains unchanged irrespective of how the gross additions are distributed. When vintage group depreciation methods are used, the depreciation rate equals the retirement rate which results in credits to the depreciation reserve (accruals) which are equal to the debits (retirements) and no depreciation reserve is accumulated. This is not the case when ELG procedures are used because of the accelerated nature of the depreciation rates and therefore, depreciation accruals will exceed retirements.

Conclusion

The foregoing analyses have shown that the prospective method is heavily dependent on the amount of dispersion and can even result in a zero reserve ratio – a condition that would rarely exist had whole life ELG depreciation practices been used.

TABLE 1

Calculation of Accumulated Recoupment Using the Retrospective Method

Average Service Life = 5 Iowa Curve = S0

Year Placed	Gross Additions	Total Acc Rec	1 0.14949	2 0.39327	3 0.58037	4 0.72243	5 0.82741	6 0.90171	7 0.95093	8 0.98026	9 0.99471	10 0.99942
1985	1,000	149.49	149.49	393.27	580.37	722.43	827.41	901.71	950.93	980.26	994.71	999.42
1986	1,000	542.76	149.49	393.27	580.37	722.43	827.41	901.71	950.93	980.26	994.71	
1987	1,000	1,123.13	149.49	393.27	580.37	722.43	827.41	901.71	950.93	980.26		
1988	1,000	1,845.56	149.49	393.27	580.37	722.43	827.41	901.71	950.93			
1989	1,000	2,672.97	149.49	393.27	580.37	722.43	827.41	901.71				
1990	1,000	3,574.68	149.49	393.27	580.37	722.43	827.41					
1991	1,000	4,525.61	149.49	393.27	580.37	722.43						
1992	1,000	5,505.87	149.49	393.27	580.37							
1993	1,000	6,500.58	149.49	393.27								
1994	1,000	7,500.00	149.49									

The accumulated recoupment (Acc Rec) for all vintages is the diagonal sum of the individual vintages.
i.e. 7,500.00 = 149.49+393.27+580.37 etc.

TABLE 2

Calculation of Average Remaining Life

Average Service Life = 5 Iowa Curve = S0 Net Salvage = Nil

Year Placed	Gross Additions	Proportion Surviving	Plant Remaining 1/1/95	Remaining Life	Survivors X Remaining Life
1994	1,000	0.988	988.00	4.559	4,504.00
1993	1,000	0.925	925.00	3.839	3,551.00
1992	1,000	0.825	825.00	3.240	2,673.00
1991	1,000	0.704	704.00	2.713	1,910.00
1990	1,000	0.569	569.00	2.236	1,272.00
1989	1,000	0.431	431.00	1.795	774.00
1988	1,000	0.296	296.00	1.383	409.00
1987	1,000	0.175	175.00	0.999	175.00
1986	1,000	0.075	75.00	0.654	49.00
1985	1,000	0.012	12.00	0.500	6.00
SUM	**10,000**		**5,000.00**		**15,323.00**

ARL = 3.06

Sum of Retirements = 10,000-5,000=5,000
Reserve Ratio = 1 - ARL/ASL = 0.387

TABLE 3

Comparison of Reserve Ratios
Retrospective Method Verses Prospective Method

Iowa Curve	Unitized Variance	Plant Remaining	Retrospect Method Theoretical Reserve	Retrospect Method Reserve Ratio	Prospect Method Remaining Life	Prospect Method Reserve Ratio
SQ	0.000000	35,500	16,925	0.4768	5.2324	0.4768
S6	0.005672	35,468	16,904	0.4766	5.2628	0.4737
S5	0.013943	35,426	16,876	0.4764	5.3077	0.4692
R5	[illegible]	35,409	16,866	0.4763	5.3395	0.4661
L5	0.026711	35,357	16,827	0.4759	5.3690	0.4631
S4	0.030136	35,345	16,823	0.4760	5.3877	0.4612
R4	0.042466	35,290	16,787	0.4757	5.4424	0.4558
L4	0.054606	35,218	16,735	0.4752	5.5049	0.4495
S3	0.059513	35,199	16,725	0.4752	5.5460	0.4454
R3	0.077475	[illegible]	16,666	0.4747	5.6372	0.4363
S2	0.096152	35,017	16,603	0.4741	5.7228	0.4277
L3	[illegible]	34,947	16,559	0.4738	5.7983	0.4202
R2	0.135946	34,819	16,473	0.4731	5.9498	0.4050
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.3992
L2	0.183328	34,575	16,307	0.4716	6.1532	0.3847
R1	[illegible]	[illegible]	[illegible]	0.4707	[illegible]	0.3635
S0	0.222359	34,387	16,187	0.4706	6.3943	0.3606
[illegible]	0.272051	[illegible]	[illegible]	0.4692	6.6229	0.3377
O1	0.333333	33,825	15,809	0.4674	6.9906	0.3009
L0	0.396297	[illegible]	[illegible]	0.4655	[illegible]	0.2737
O2	0.486121	32,919	15,217	0.4623	7.7871	0.2213
O3	0.822299	30,946	[illegible]	[illegible]	9.6870	[illegible]
EXP	1.000000	30,651	13,385	0.4367	10.0000	0.0000
O4	1.206824	29,527	[illegible]	[illegible]	[illegible]	[illegible]

Local Exchange Carrier Depreciation Reserve Percents

Richard B. Lee and Michael J. Majoros, Jr.

Abstract

In 1980, the Federal Communications Commission changed its procedures and orientation with respect to the prescription of depreciation rates for telephone companies. This paper examines the effect of these changes on the depreciation reserve percents of local exchange carriers.

Introduction

Twenty years ago, the Federal Communications Commission ("FCC") radically changed its approach to the prescription of depreciation rates for telephone companies. The FCC's Report and Order in Docket No. 20188 adopted Straight Line Equal Life Group ("SLELG") and remaining-life depreciation procedures.[1] More importantly, the FCC changed its orientation. As the FCC has stated:

> In 1980, the Commission departed from its previous practice of relying largely on historical experience to project lives and began to rely on analysis of company plans, technological developments, and other future oriented studies.[2]

The purpose of this paper is to examine the effect of these changes on the depreciation reserve percents of local exchange carriers ("LECs").

LEC Deprecation Reserve Percents

The FCC and others have long relied upon the depreciation reserve for insight into the workings of the depreciation process. The FCC staff had stated:

> The depreciation reserve is an extremely important indicator of the depreciation process because it is the accumulation of all past depreciation accruals net of plant retirements. As such, it represents the amount of a carrier's original investment that has already been returned to the carrier by its customers.[3]

The FCC recognition of the reserve level as an indicator of the depreciation process can best be understood by examining a steady state example. Assume that we start with a stable environment in which the average age of plant is 9 years and the expected life of plant is 27 years. In this case, the add rate, retirement rate and straight-line accrual rate are all 3.7 percent, and the reserve level is stable at 33 percent of plant in service (9 years/27 years).[4] As we vary these factors, we can see the effect on the reserve level. For example:

- If the add rate were to increase above 3.7 percent, the reserve level would go down. This would not be a cause for concern, since the average age of plant would similarly represent a lower percent of its expected life.
- If the retirement rate were to increase above 3.7 percent, the reserve level would go down. This would be a cause for concern, since it would indicate that the expected life of plant is shorter than previously expected. If the expected life is shorter, the average age of plant would represent a higher percent of its expected life, and reserve should be higher, not lower than 33 percent.
- If the accrual rate were to increase above 3.7 percent, the reserve level would go up. This would not be appropriate absent a reduction in the expected life of the plant, since it would indicate that the average age of plant is higher than 33 percent of its expected life.

In summary, a declining reserve percent would be a reason for concern absent indications that it is merely the result of growth in plant. On the other hand, a rising reserve percent is generally a positive sign that the depreciation process is working well. Indeed, absent indications that the expected life of plant is decreasing, it might be a sign that accrual rates are too high.

Table 1 displays depreciation reserve levels and various plant rates since 1946 for all LECs providing full financial reports to the FCC. Figure 1 plots the LEC depreciation reserve percent as shown in Column m of Table 1. As shown on Figure 1, reserve percents decreased steadily following World War II due to industry growth. These declines continued through the 1970's due in part to accrual rates which were too low.[5] The FCC 's change to forward-looking depreciation practices in the early 1980's, however, resulted in a dramatic rise in reserve levels after 1980. The composite reserve level rose from 18.7 percent in 1980 to an historic high of 52.1 percent in 1999. This track record indicates that the depreciation process has worked well since 1980.

Confirmation of the forward-looking nature of current FCC prescriptions can be gained by comparing the 1999 composite accrual rate of 7.2 percent (Table 1, Page 3, Column l) to the 1999 retirement rate of 3.6 percent (Table 1, Page 3, Column k). The prescription of an accrual rate much higher than the current retirement rate indicates an expectation that the retirement rate will be much higher in the future. If the FCC were prescribing depreciation rates based upon historical indicators, it would be prescribing rates in the range of 3 to 5 percent.

Table 2 summarizes the latest data available on depreciation reserve levels for the large LECs by jurisdiction. A scan of Column c reveals that the dramatic increase in LEC reserve percents since 1980 is ubiquitous. January 1, 2000, book reserves are as follows for the major LEC holding companies.

BellSouth	54.9 percent
SBC	52.0
Verizon	51.5
Qwest	52.8

Table 2 also displays the theoretical reserve as of January 1, 2000, for each jurisdiction of each LEC (Column d) and compares these levels to booked reserve levels. Overall, the large LECs report a depreciation reserve surplus of $11.2 billion, or 3.8 percent, as of January 1, 2000. The surplus by major LEC holding company is:

BellSouth	$2.7 billion
SBC	3.3
Verizon	4.2
Qwest	1.0

Conclusion

The FCC's 1980 change in procedures and orientation has resulted in dramatically higher depreciation reserve levels. It must be noted, however, that many LEC representatives contend that depreciation reserve levels are still too low, and FCC prescribed lives still too long.

Since the depreciation process, by its very nature, is based upon future expectations, it will be many years before we will know whether the LECs entered the 21st Century with depreciation reserves that were lower – or higher – than they need be. The benefit of hindsight, however, allows us now to conclude that the changes begun by the FCC in 1980 achieved their intended purpose. For the many past and present members of the Society of Depreciation Professionals who helped chart the course of telephone depreciation over the past 20 years, a tip of the hat is in order.

References:

[1] Amendment of Part 31 (Uniform System of Accounts for Class A and Class B Telephone Companies) so as to permit depreciable property to be placed in groups comprised of units with expected equal life for depreciation under the straight-line method, Docket No. 20188, Report and Order, FCC 80-650, released December 5, 1980.

[2] 1998 Biennial Regulatory Review – Review of Depreciation Requirements for Incumbent Local Exchange Carriers, CC Docket No. 98-137, Report and Order, FCC 99-397, released December 30, 1999, para. 5

[3] Report on Telephone Industry Depreciation, Tax and Capital/Expense Policy, Accounting and Audis Division, April 15, 1987 ("AAD Report"), pp. 5-6.

[4] Reserve will stabilize at 33 percent assuming a triangular (straight-line) mortality curve. See Notes for Engineering Economics Courses, American Telephone and Telegraph Company, Engineering Department, 1966, p. 121.

[5] AAD Report, p. 7.

Table 1 - Plant Related Rates of All Reporting LECs (Dollars in Millions)

	Telecommunications Plant in Service							EOY	AVG	Add	Retire	Deprec	Reserve
	BOY (a)	EOY (b)	Average (c)=(a+b)/2	Increase (d) = b-a	Add (e)	Ret (f)	Deprec (g)	Reserve (h)	Reserve (i)	Rate (j) = e/a	Rate (k) = f/a	Rate (l) = g/c	Percent (m) = h/b
1946		6,500						2,300					35.4
1947	6,500	7,400	6,950	900				2,500	2,400				33.8
1948	7,400	8,700	8,050	1,300				2,600	2,550				29.9
1949	8,700	9,800	9,250	1,100				2,800	2,700				28.6
1950	9,800	10,500	10,150	700				3,000	2,900				28.6
1951	10,500	11,300	10,900	800				3,200	3,100				28.3
1952	11,300	12,300	11,800	1,000				3,400	3,300				27.6
1953	12,300	13,400	12,850	1,100				3,600	3,500				26.9
1954	13,400	14,600	14,000	1,200				3,800	3,700				26.0
1955	14,600	15,800	15,200	1,200				4,100	3,950				25.9
1956	15,800	17,400	16,600	1,600				4,300	4,200				24.7
1957	17,400	19,600	18,500	2,200				4,600	4,450				23.5
1958	19,600	22,000	20,800	2,400				4,900	4,750				22.3
1959	22,000	23,000	22,500	1,000				5,200	5,050				22.6
1960	23,000	25,000	24,000	2,000	2,700	700	1,100	5,600	5,400	11.7	3.0	4.6	22.4
1961	25,000	27,000	26,000	2,000	2,800	800	1,200	6,000	5,800	11.2	3.2	4.6	22.2
1962	27,000	29,000	28,000	2,000	2,900	900	1,300	6,400	6,200	10.7	3.3	4.6	22.1
1963	29,000	32,000	30,500	3,000	4,000	1,000	1,400	6,800	6,600	13.8	3.4	4.6	21.3
1964	32,000	34,000	33,000	2,000	2,900	900	1,600	7,500	7,150	9.1	2.8	4.8	22.1
1965	34,000	37,000	35,500	3,000	4,100	1,100	1,700	8,100	7,800	12.1	3.2	4.8	21.9
1966	37,000	40,000	38,500	3,000	4,100	1,100	1,900	8,900	8,500	11.1	3.0	4.9	22.3
1967	40,000	44,000	42,000	4,000	5,100	1,100	2,100	9,900	9,400	12.8	2.8	5.0	22.5

Table 1 - Plant Related Rates of All Reporting LECs (Dollars in Millions)

	Telecommunications Plant in Service												
	BOY (a)	EOY (b)	Average (c)=(a+b)/2	Increase (d) = b-a	Add (e)	Ret (f)	Deprec (g)	EOY Reserve (h)	AVG Reserve (i)	Add Rate (j) = e/a	Retire Rate (k) = f/a	Deprec Rate (l) = g/c	Reserve Percent (m) = h/b
1968	43,249	47,123	45,186	3,874	5,104	1,230	2,304	10,979	10,440	11.8	2.8	5.1	23.3
1969	47,175	51,724	49,450	4,549	6,022	1,473	2,507	12,072	11,526	12.8	3.1	5.1	23.3
1970	51,723	56,951	54,337	5,228	6,880	1,651	2,751	13,213	12,643	13.3	3.2	5.1	23.2
1971	56,972	63,090	60,031	6,118	8,052	1,933	3,016	14,447	13,830	14.1	3.4	5.0	22.9
1972	63,068	69,870	66,469	6,802	9,044	2,242	3,330	15,643	15,045	14.3	3.6	5.0	22.4
1973	69,951	77,442	73,697	7,491	10,085	2,595	3,659	16,769	16,206	14.4	3.7	5.0	21.7
1974	77,107	84,888	80,998	7,781	11,024	3,243	4,047	17,685	17,227	14.3	4.2	5.0	20.8
1975	84,799	92,284	88,542	7,485	10,881	3,396	4,486	18,809	18,247	12.8	4.0	5.1	20.4
1976	92,591	99,879	96,235	7,288	11,139	3,856	4,934	20,163	19,486	12.0	4.2	5.1	20.2
1977	101,237	109,496	105,367	8,259	12,438	4,136	5,630	21,903	21,033	12.3	4.1	5.3	20.0
1978	109,502	119,336	114,419	9,834	14,549	4,681	6,199	23,474	22,689	13.3	4.3	5.4	19.7
1979	118,612	129,972	124,292	11,360	16,843	5,452	6,820	24,881	24,178	14.2	4.6	5.5	19.1
1980	129,767	142,096	135,932	12,329	18,694	6,378	7,804	26,512	25,697	14.4	4.9	5.7	18.7
1981	142,121	155,845	148,983	13,724	19,482	5,749	8,664	29,932	28,222	13.7	4.0	5.8	19.2
1982	155,907	168,075	161,991	12,168	18,466	6,409	9,757	33,957	31,945	11.8	4.1	6.0	20.2
1983	169,162	178,482	173,822	9,320	16,076	6,664	11,340	39,571	36,764	9.5	3.9	6.5	22.2
1984	152,315	159,798	156,057	7,483	14,994	4,994	10,048	37,996	38,784	9.8	3.3	6.4	23.8
1985	174,218	186,294	180,256	12,076	18,972	6,687	11,469	43,837	40,917	10.9	3.8	6.9	25.7
1986	186,972	198,758	192,865	11,786	18,907	6,954	13,142	51,543	47,690	10.1	3.7	7.5	28.4
1987	199,063	209,687	204,375	10,624	18,535	7,886	15,263	61,471	56,507	9.3	4.0	8.1	31.6
1988	210,720	220,395	215,558	9,675	17,947	8,949	16,627	74,123	67,797	8.5	4.2	7.7	33.6

Table 1 - Plant Related Rates of All Reporting LECs (Dollars in Millions)

	Telecommunications Plant in Service BOY (a)	EOY (b)	Average (c)=(a+b)/2	Increase (d) = b-a	Add (e)	Ret (f)	Deprec (g)	EOY Reserve (h)	AVG Reserve (i)	Add Rate (j) = e/a	Retire Rate (k) = f/a	Deprec Rate (l) = g/c	Reserve Percent (m) = h/b
1989	220,126	229,326	224,726	9,200	16,868	8,145	16,839	83,115	78,619	7.7	3.7	7.5	36.2
1990	229,103	235,247	232,175	6,144	18,473	12,380	16,955	88,146	85,631	8.1	5.4	7.3	37.5
1991	236,093	241,620	238,857	5,527	18,322	12,896	16,607	91,427	89,787	7.8	5.5	7.0	37.8
1992	242,599	249,508	246,054	6,909	18,877	12,138	17,036	98,053	94,740	7.8	5.0	6.9	39.3
1993	250,570	258,782	254,676	8,212	18,864	11,217	17,676	106,079	102,066	7.5	4.5	6.9	41.0
1994	259,216	267,443	263,330	8,227	18,781	10,990	18,656	114,598	110,339	7.2	4.2	7.1	42.8
1995	268,555	278,946	273,751	10,391	19,482	9,411	19,393	125,789	120,194	7.3	3.5	7.1	45.1
1996	278,974	291,569	285,272	12,595	22,401	10,271	20,527	137,278	131,534	8.0	3.7	7.2	47.1
1997	291,569	303,809	297,689	12,240	23,171	11,627	21,156	148,163	142,721	7.9	4.0	7.1	48.8
1998	303,689	319,767	311,728	16,078	24,218	9,337	21,947	162,102	155,133	8.0	3.1	7.0	50.7
1999	319,809	335,486	327,648	15,677	26,304	11,641	23,455	174,922	168,512	8.2	3.6	7.2	52.1
Avg.	'60-'83									12.6	3.6	5.2	
	'84-'99									8.4	4.1	7.2	

Source: 1946 -1967 Report on Telephone Industry Depreciation, Tax and Capital/Expense Policy, Accounting and Audits Division, FCC, April 15, 1987, pp.6, 9
1968 - 1983 FCC Statistics of Common Carriers, Tables 12 and 16
1984 - 1987 FCC Statistics of Common Carriers, Tables 10 and 14
1988 - 1999 FCC Statistics of Common Carriers, Tables 2.7 and 2.9

Note 1: 1946 - 1983 Includes AT&T

Note 2: Cols l and m for 1985-1987 from Table 14 data as follows:
Col l = 1985 Col g/165,076
1986 Col g/175,926
1987 Col g/187,920
Col m = 1985 Col h/170,355
1986 Col h/181,496
1987 Col h/194,343

Figure 1 - Depreciation Reserve Percent of All Reporting LECs

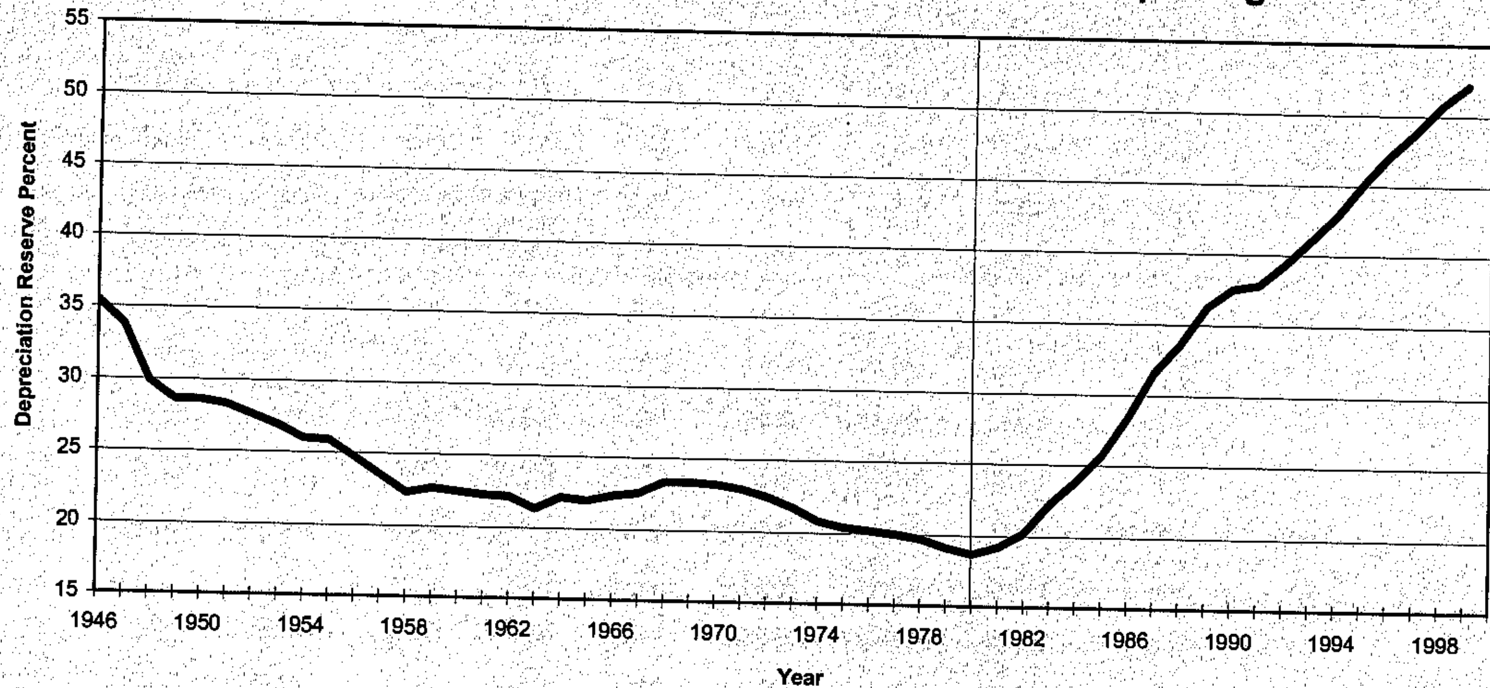

Table 2 - Summary of Reserves On FCC Basis (Dollars in Thousands)

Company	State	1/1/200 Investment a	Book Reserve b	Percent c = b / a	Theoretical Reserve d	Percent e = d / a	Surplus f = b - d	Percent g = f / a
BellSouth	Alabama	4,728,624	2,588,942	54.8%	2,300,246	48.6%	288,696	6.1%
	Florida	12,133,820	6,771,377	55.8%	6,154,269	50.7%	617,108	5.1%
	Georgia	9,510,079	4,948,578	52.0%	4,561,441	48.0%	387,137	4.1%
	Kentucky	2,651,617	1,433,362	54.1%	1,249,714	47.1%	183,648	6.9%
	Louisiana	4,816,754	2,954,269	61.3%	2,560,408	53.2%	393,861	8.2%
	Mississippi	3,140,043	1,837,365	58.5%	1,587,703	50.6%	249,662	8.0%
	North Carolina	5,351,131	2,863,178	53.5%	2,610,480	48.8%	252,698	4.7%
	South Carolina	3,209,442	1,777,727	55.4%	1,645,863	51.3%	131,864	4.1%
	Tennessee	5,270,119	2,707,347	51.4%	2,472,196	46.9%	235,151	4.5%
	Total	**50,811,630**	**27,882,145**	**54.9%**	**25,142,321**	**49.5%**	**2,739,825**	**5.4%**
BellSouth	**Grand Total**	**50,811,630**	**27,882,145**	**54.9%**	**25,142,321**	**49.5%**	**2,739,825**	**5.4%**
SBC								
Ameritech	Illinois	10,340,669	5,335,279	51.6%	4,812,287	46.5%	522,992	5.1%
	Indiana	3,557,172	1,977,532	55.6%	1,819,112	51.1%	158,420	4.5%
	Michigan	8,993,668	5,243,258	58.3%	4,782,805	53.2%	460,452	5.1%
	Ohio	6,810,225	3,688,364	54.2%	3,403,679	50.0%	284,684	4.2%
	Wisconsin	3,142,624	1,569,844	50.0%	1,438,681	45.8%	131,163	4.2%
	Total	**32,844,358**	**17,814,277**	**54.2%**	**16,256,564**	**49.5%**	**1,557,712**	**4.7%**
Southwestern Bell	Arkansas	2,118,200	1,135,909	53.6%	1,070,997	50.6%	64,912	3.1%
	Kansas	2,535,972	1,318,041	52.0%	1,261,073	49.7%	56,968	2.2%
	Missouri	5,447,116	2,660,164	48.8%	2,731,276	50.1%	-71,112	-1.3%
	Oklahoma	3,117,247	1,723,250	55.3%	1,626,159	52.2%	97,091	3.1%
	Texas	19,914,198	10,044,176	50.4%	9,684,323	48.6%	359,853	1.8%
	Total	**33,132,732**	**16,881,539**	**51.0%**	**16,373,828**	**49.4%**	**507,711**	**1.5%**
Pacific Nevada	California	29,294,939	14,768,182	50.4%	13,736,712	46.9%	1,031,470	3.5%
	Nevada	659,520	315,567	47.8%	276,121	41.9%	39,446	6.0%
	Total	**29,954,459**	**15,083,749**	**50.4%**	**14,012,833**	**46.8%**	**1,070,916**	**3.6%**
SNET	Connecticut	4,598,585	2,480,233	53.9%	2,366,166	51.5%	114,068	2.5%
	Total	**4,598,585**	**2,480,233**	**53.9%**	**2,366,166**	**51.5%**	**114,068**	**2.5%**
SBC	**Grand Total**	**100,530,134**	**52,259,798**	**52.0%**	**49,009,391**	**48.8%**	**3,250,407**	**3.2%**

Table 2 - Summary of Reserves On FCC Basis (Dollars in Thousands)

Company	State	1/1/200 Investment a	Book Reserve b	Percent c = b / a	Theoretical Reserve d	Percent e = d / a	Surplus f = b - d	Percent g = f / a
Verizon								
Bell Atlantic	Delaware	930,520	462,823	49.7%	436,979	47.0%	25,844	2.8%
	Maine	1,542,943	888,876	57.6%	791,082	51.3%	97,794	6.3%
	Maryland	6,309,947	3,270,313	51.8%	3,103,884	49.2%	166,429	2.6%
	Massachusetts	9,067,759	4,808,281	53.0%	4,582,630	50.5%	225,651	2.5%
	New Hampshire	1,755,094	978,795	55.8%	889,999	50.7%	88,795	5.1%
	New Jersey	10,578,756	5,367,616	50.7%	5,085,630	48.1%	281,985	2.7%
	New York	22,242,043	11,759,612	52.9%	11,237,535	50.5%	522,077	2.3%
	Pennsylvania	10,741,583	5,519,563	51.4%	5,252,983	48.9%	266,580	2.5%
	Rhode Island	1,064,622	604,750	56.8%	584,453	54.9%	20,296	1.9%
	Vermont	874,388	526,113	60.2%	488,001	55.8%	38,112	4.4%
	Virginia	6,584,125	3,249,933	49.4%	2,932,000	44.5%	317,933	4.8%
	Washington, DC	1,817,981	832,788	45.8%	855,509	47.1%	-22,720	-1.2%
	West Virginia	1,895,836	1,093,819	57.7%	1,011,514	53.4%	82,305	4.3%
	Total	**75,405,596**	**39,363,280**	**52.2%**	**37,252,198**	**49.4%**	**2,111,082**	**2.8%**
GTE - North	Illinois	1,975,784	1,052,398	53.3%	863,379	43.7%	189,019	9.6%
	Indiana	2,160,735	1,105,918	51.2%	854,279	39.5%	251,639	11.6%
	Michigan	1,619,014	834,002	51.5%	679,040	41.9%	154,962	9.6%
	Ohio	1,810,151	955,663	52.8%	959,962	53.0%	-4,298	-0.2%
	Pennsylvania	1,278,243	675,686	52.9%	517,293	40.5%	158,393	12.4%
	Wisconsin	1,209,787	659,627	54.5%	519,641	43.0%	139,986	11.6%
	Total	**10,053,713**	**5,283,294**	**52.6%**	**4,393,593**	**43.7%**	**889,701**	**8.8%**
GTE - Florida	Florida	4,651,471	2,289,087	49.2%	1,879,926	40.4%	409,162	8.8%
	Total	**4,651,471**	**2,289,087**	**49.2%**	**1,879,926**	**40.4%**	**409,162**	**8.8%**
GTE - South	Alabama	669,829	353,541	52.8%	298,005	44.5%	55,536	8.3%
	Kentucky	1,340,720	708,451	52.8%	560,803	41.8%	147,649	11.0%
	North Carolina	958,721	487,755	50.9%	420,928	43.9%	66,827	7.0%
	South Carolina	471,465	254,920	54.1%	219,853	46.6%	35,066	7.4%
	Virginia	1,241,071	571,418	46.0%	608,558	49.0%	-37,139	-3.0%
	Total	**4,681,807**	**2,376,086**	**50.8%**	**2,108,148**	**45.0%**	**267,938**	**5.7%**
GTE - Midwest	Iowa	646,701	315,295	48.8%	245,137	37.9%	70,158	10.8%
	Missouri	1,246,790	534,728	42.9%	461,025	37.0%	73,703	5.9%
	Nebraska	122,160	63,552	52.0%	47,861	39.2%	15,690	12.8%
	Total	**2,015,651**	**913,575**	**45.3%**	**754,023**	**37.4%**	**159,552**	**7.9%**

Table 2 - Summary of Reserves On FCC Basis (Dollars in Thousands)

Company	State	1/1/200 Investment a	Book Reserve b	Percent c = b / a	Theoretical Reserve d	Percent e = d / a	Surplus f = b - d	Percent g = f / a
GTE - Southwest	Arkansas	254,846	132,161	51.9%	113,488	44.5%	18,673	7.3%
	New Mexico	237,711	144,047	60.6%	121,900	51.3%	22,147	9.3%
	Oklahoma	291,545	142,203	48.8%	129,729	44.5%	12,474	4.3%
	Texas	5,008,377	2,554,363	51.0%	2,215,536	44.2%	338,826	6.8%
	Total	**5,792,479**	**2,972,772**	**51.3%**	**2,580,652**	**44.6%**	**392,120**	**6.8%**
GTE - Northwest	Idaho	375,911	175,276	46.6%	176,522	47.0%	-1,246	-0.3%
	Oregon	988,007	449,484	45.5%	458,911	46.4%	-9,427	-1.0%
	Washington	2,166,013	953,169	44.0%	988,867	45.7%	-35,698	-1.6%
	Total	**3,529,931**	**1,577,929**	**44.7%**	**1,624,300**	**46.0%**	**-46,371**	**-1.3%**
GTE - Hawaii	Hawaii	1,805,756	818,050	45.3%	865,747	47.9%	-47,698	-2.6%
	Total	**1,805,756**	**818,050**	**45.3%**	**865,747**	**47.9%**	**-47,698**	**-2.6%**
Contel of CA	California	967,250	535,019	55.3%	458,588	47.4%	76,432	7.9%
	Total	**967,250**	**535,019**	**55.3%**	**458,588**	**47.4%**	**76,432**	**7.9%**
Verizon	**Grand Total**	**108,903,653**	**56,129,092**	**51.5%**	**51,917,174**	**47.7%**	**4,211,918**	**3.9%**
QWEST	Arizona	4,867,211	2,498,897	51.3%	2,339,011	48.1%	159,886	3.3%
	Colorado	6,329,581	3,053,272	48.2%	2,930,908	46.3%	122,365	1.9%
	Idaho	979,654	542,807	55.4%	492,858	50.3%	49,949	5.1%
	Iowa	1,976,774	1,226,089	62.0%	1,109,837	56.1%	116,251	5.9%
	Minnesota	4,049,580	2,202,767	54.4%	1,989,474	49.1%	213,292	5.3%
	Montana	789,112	426,935	54.1%	409,460	51.9%	17,475	2.2%
	Nebraska	1,421,543	814,764	57.3%	761,559	53.6%	53,205	3.7%
	New Mexico	1,812,691	1,006,313	55.5%	994,459	54.9%	11,854	0.7%
	North Dakota	498,723	315,619	63.3%	277,089	55.6%	38,530	7.7%
	Oregon	2,605,356	1,291,610	49.6%	1,276,472	49.0%	15,138	0.6%
	South Dakota	622,701	377,124	60.6%	333,412	53.5%	43,713	7.0%
	Utah	2,311,759	1,106,575	47.9%	1,084,413	46.9%	22,162	1.0%
	Washington	4,941,371	2,647,613	53.6%	2,539,880	51.4%	107,733	2.2%
	Wyoming	743,235	424,876	57.2%	397,588	53.5%	27,288	3.7%
	Total	**33,949,291**	**17,935,261**	**52.8%**	**16,936,421**	**49.9%**	**998,840**	**2.9%**
QWEST	**Grand Total**	**33,949,291**	**17,935,261**	**52.8%**	**16,936,421**	**49.9%**	**998,840**	**2.9%**
Large LECs	**Total**	**294,194,708**	**154,206,297**	**52.4%**	**143,005,307**	**48.6%**	**11,200,990**	**3.8%**

Source: Carrier submissions pursuant to Section C-1 of Depreciation Study Guide

The Purpose of Depreciation Accounting

John S Ferguson CDP

Abstract

The determination of depreciation rates that are consistent with the purpose of depreciation accounting requires a basic understanding of that purpose. The major thrust of this discussion is the purpose applicable to regulated entities, which is specified by a framework of accounting and regulatory principles and regulatory rules. However, the purpose applicable to non-regulated entities, which is specified by accounting principles, is also mentioned.

The effects on utility customers of departing from the framework applicable to regulated entities are illustrated. These effects show that customers benefit from adherence to this framework, so demonstrate the importance of depreciation analysts having a thorough understanding of accounting and regulatory principles and regulatory rules.

This discussion is prompted by my 1998 Society Journal critique of the 1996 edition of the National Association of Regulatory Utility Commissioners (NARUC) publication, *Public Utility Depreciation Practices*. That critique stated that, in my opinion, the 1996 edition retained significant shortcomings of the prior edition, including a quite limited discussion of the purpose of depreciation accounting and the lack of any discussion of the link between this purpose and the depreciation rate development process.

The Item and Group Depreciation Accounting Concepts

A capitalization policy is involved in both of these depreciation concepts, which may be specified or may be inherent in accounting practices. Capitalization policy is of importance to this discussion, because it controls the magnitude of book depreciation rates. The most practical way to distinguish between capital and expense transactions is through physical descriptions of property. For the item concept, capital items are specifically recorded and individually depreciated. For the group concept, capital items may or may not be recorded individually and are grouped in some fashion for depreciation purposes.

Physical descriptions provide the most practical capitalization policy, because field and office personnel can easily relate to descriptions. Therefore, field personnel can be expected to report retirements when items so described are removed or replaced, and office personnel can be expected to easily catch reporting errors. Uniform Systems of Accounts (Systems) require that regulated entities use physical descriptions for most property, but the Systems of the Federal Energy Regulatory Commission (FERC) no longer specify the maximum size of the items that can be utilized. Non-regulated entities could adopt investment amounts as their capitalization policy, but doing so for group depreciation invites unreported retirements, because field personnel are unlikely to have information on the amounts recorded for the items (retirement units) they are removing or replacing.

For the item concept commonly utilized by non-regulated entities, retirement prior to a capitalized item being fully depreciated results in a loss being recorded. Likewise, when items become fully depreciated, recording of depreciation ceases, and a gain might be recorded at the time of retirement. Either situation is easily identified, because depreciation rates are applied to each item individually, and the accumulated provision for depreciation (book reserve) is maintained for each item. If material, net salvage should be reflected in depreciation rates, but may not be, because of limitations of the fixed asset accounting software utilized by non-regulated entities.

For the group concept utilized by regulated entities, items are grouped in whatever manner is determined appropriate, so that a single depreciation rate can be applied to the depreciable balance of the entire group in order to calculate depreciation provisions. The life and net salvage used to determine each depreciation rate are averages, so apply to the entire group of property, not to any individual component. As a result, the expectation of retiring some items earlier than others is inherent in the determination of the depreciation rates. Therefore, normal retirements are considered as being fully depreciated no matter at what ages they occur, so gains and losses are not recorded and depreciation ceases only when the entire property group is fully depreciated. With the group concept, there may be extraordinary retirements for which losses would be recorded, but such retirements are rare and require specific regulatory authority.

Non-regulated entities have the option of adopting the group concept, so could develop depreciation rates in manners that limit or preclude losses from occurring.

For the item concept, the reasonableness of the depreciable lives can easily be determined from the extent of fully depreciated assets that remain productive and the extent of losses recorded for the retirement of property not fully depreciated. For the group concept, this reasonableness can be determined only through conducting a special study.

The Accounting and Regulatory Framework

Book depreciation accounting is merely the recognition in financial statements that physical assets are consumed in the process of providing a service or a product. For example, if the owner of a taxi does not charge the riders a proportional share of the consumption of the automobile, the vehicle will eventually be worn out and the owner will have nothing to show for it. However, it should be remembered that book depreciation accounting as practiced in the United States is for the recording the costs related to the investment in the original taxi; not for providing for its replacement. Book depreciation accounting for regulated entities involves both recording of depreciation and its recovery through the regulatory process, so is often referred to as capital recovery.

The most widely recognized accounting definition of depreciation is that of the American Institute of Certified Public Accountants (AICPA), which states:

> Depreciation accounting is a system of accounting which aims to distribute cost or other basic value of tangible capital assets, less salvage value (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.

Several aspects of this definition are important:

- Salvage (net salvage) is to be recognized;
- The allocation of cost is to be over life;
- The assets being depreciated may be a group of assets;
- Depreciation accounting is a process of allocation, not valuation;
- The allocation is not required to match the specific occurrences in any given year;
- And most importantly, the allocation is to be both systematic and rational.

Being systematic and rational is a generally accepted accounting principle for non-regulated entities (GAAP). It is not difficult to be systematic through the use of formulas. Rational is not so easy. To be rational, recording of depreciation provisions should, to the extent possible, match either the pattern of consumption of the assets or the pattern of revenues generated by the assets, which is accomplished through the pattern of depreciation rates. Matching of depreciation provisions with either the consumption or the revenues ensures that financial statements will accurately reflect the results of operations and changes in financial position.

Most types of utility property are utilized at a relatively constant rate over their lifetime, so constant depreciation rates would comply with the GAAP requirement of being rational. Some property types exhibit distinctive usage patterns, with the patterns usually reflecting usage that decreases with age. There may be situations where patterns increase, but they are rare and are most likely to be exhibited only during the early years of life. Therefore, to be rational, the property of regulated entities typically requires constant or decreasing depreciation rates.

The AICPA definition refers to *salvage*, which I interpret to mean *net salvage*, because at the time the AICPA definition was developed it was common for accounting literature to use *salvage* to mean *either salvage or net salvage*, and some authors still do so. Under my interpretation, cost of removal has the same accounting guidance as do investment and salvage. If the meaning really is *salvage*, then the only current specific financial accounting guidance for accrual of cost of removal is for oil and gas production facilities by Statement No. 19 of the Financial Accounting Standards Board (FASB) and for solid waste disposal sites by Statement No. 18 of the Government Accounting Standards Board. An option for handling cost of removal under GAAP is through liability accounting rather than through depreciation accounting. The liability would be recorded through periodic charges to income, and the rules for depreciation accounting would not apply for financial accounting purposes.

A current project of the FASB that addresses the financial accounting for and disclosure of obligations associated with the retirement of long-lived assets will alter the financial accounting guidance for salvage and cost of removal. In February 1996, the FASB issued a proposed accounting standard, and in February 2000, issued a revised proposal. The latest proposal specifies that legal or constructive removal or closure obligations (negative net salvage) be recorded as a liability.[1] Under liability treatment, the negative net salvage (net removal cost) measured at the price level expected at the time of incurrence is to be discounted to the date of the financial statement. The proposed discount rate is higher than the future inflation rate, which causes the discounted amount to be lower than the estimated amount measured at the current price level. This approach will cause the pattern of expenses recorded for net removal cost to increase over the lifetime of the related asset, due to the present value calculation being a single-contribution annuity, the initial present value of which is to be recorded on a ratable basis through depreciation. Net removal cost for obligations that do not qualify for liability treatment is proposed to be expensed when incurred, which is even more back-loaded than is the proposed liability treatment. Therefore, the FASB proposal would require that net removal cost be recorded in a manner that does not match the typical pattern of usage of utility property. Positive net salvage would continue to be treated on a ratable basis through depreciation.

The FASB proposal will affect the financial accounting for net removal cost - not the regulatory accounting. The income statements of entities that qualify for the special accounting allowed by Statement of Financial Accounting Standards No. 71, *Accounting for the Effects of Certain Types of Regulation* (SFAS 71), will reflect regulatory accounting. Any differences between regulatory accounting treatment of net removal cost and financial accounting treatment would be disclosed on the balance sheet, which will dictate maintaining depreciation records on both a regulatory accounting basis and on a financial accounting basis.

Price regulation controls the revenues of a regulated entity, so the market place does not automatically reflect the productive capacity of assets in revenues. Therefore, consumption of the assets of regulated entities must be measured directly through conducting a depreciation study. The key to the validity of depreciation accounting for regulated entities lies in accurately estimating future asset consumption through determining the expected mortality characteristics of assets.

A matching principle that is an essential element of basic regulatory philosophy has become known as *intergenerational customer equity*. Intergenerational equity means that costs are borne by the generation of customers that caused them to be incurred - not by some earlier or later generation. This matching is required to ensure that charges to customers reflect the actual costs of providing service.

It is commonly assumed for accounting purposes that the consumption or usage of assets occurs evenly over the productive life - that is, on a straight-line basis. Productive life can be defined by a pattern of usage or by a time span of usage. Life for certain types of assets producing or utilized in a distinctive pattern, such as oil or natural gas fields, steam generating units, and railroad rail, is best defined by the pattern of production or usage. Life for assets not producing or utilized in a distinctive pattern is best defined by the time span of production or usage.

Under the accrual concept of accounting, capital expenditures are recorded as expenses through depreciation after they are made, credit for salvage is given prior to receipt, and expenses for cost of removal are recorded prior to expenditure. Thus, all the costs of ownership are reflected in financial statements over the productive life of the assets. Another accounting concept of importance is that recording is required when measurement is possible, that measurement may be an estimate, and that the estimate may be arbitrary.

Value concepts are sometimes suggested for depreciation rate determination. However, the depreciation accounting definition of the AICPA is quite specific that depreciation accounting is not a value concept.

AICPA Accounting Research Monograph 1 (ARM 1), *Accounting for Depreciable Assets*, by Lamden, Gerboth and McRae discusses the use of constraining, tailoring, and implementing criteria to determine the depreciation accounting method, procedure, and technique appropriate for an asset or group of assets, and is recommended reading. Depreciation methods are categorized as accelerated, straight-line, and deferred. Understanding these terms requires a frame of reference. Accelerated, straight-line, or deferred relative to what? Without relativity, these terms have no meaning. The

[1] See The Implications of Recent AICPA and FASB Property Accounting Pronouncements for Regulated Entities elsewhere in this Journal issue for a more current discussion of this proposal.

appropriate frame of reference is the productive life of the assets. But life measured how? For accounting purposes, life can be measured by time, by the production from assets, or by the consumption or the usage of assets.

Both regulated and non-regulated entities utilize the accelerated method for income tax depreciation, and non-regulated entities sometimes use it for accounting purposes. Non-regulated entities sometimes use the deferred method for income producing real estate. In the case of utilities, their regulatory environment generally requires the use of the straight-line method for accounting purposes. However, regulatory pressures may result in the use of the deferred method for some property groups, or in the use of the straight-line method in a manner that converts it into the deferred method.

SFAS 71 allows entities that meet all three of the following criteria to use accounting practices that are not allowed under GAAP:

- Rates for service are subject to approval by an independent body;
- The rates are designed to recover costs; and,
- The rates set at levels that will recover costs are charged and collected from customers.

Entities meeting these criteria can use depreciation rates dictated by regulators that are not in accordance with GAAP, because there is an implied regulatory promise to allow future recovery. Therefore, this discussion addresses techniques that comply with GAAP as well as techniques that do not comply with GAAP.

Entities no longer qualifying for the special accounting practices allowed by SFAS 71 must follow Statement of Financial Accounting Standards No. 101, *Regulated Enterprises - Accounting for the Discontinuation of Application of FASB Statement No. 71* (SFAS 101). SFAS 101 requires compensating for any past depreciation deferrals prospectively by increasing depreciation rates. Determining such rates will require the use of the techniques discussed herein that comply with GAAP. However, ceasing to qualify for SFAS 71 requires testing for asset impairment in accordance with Statement of Financial Accounting Standards No. 121, *Accounting for the Impairment of Long-Lived Assets and for Long-Lived Assets to Be Disposed Of*,[2] which may dictate recording an impairment loss.

ARM 1 suggests that accelerated procedures would conform to the objectives of depreciation accounting if there is evidence that:

- Net-revenue contributions or operating efficiency of an asset are indeterminate or, to the extent determinable, are a decreasing function of the age of the asset.
- Reasonably good resale market data are available and the decline in market value over time follows a decreasing pattern.
- Other asset-related charges are expected to follow an increasing pattern.
- Obsolescence is a significant but uncertain factor in estimating useful life.
- The interest factor is significant in estimating the value of the future service potential of the asset.

Sum-of-the-years-digits and *double declining balance* are examples of procedures for the accelerated method. These are recognized as tax depreciation procedures, and are used for tax purposes by regulated entities, but not for accounting purposes. Non-regulated entities may use such procedures for both tax and accounting purposes. Such procedures may be of interest to a utility depreciation analyst under certain circumstances.

Procedures for implementing the straight-line method that will be of interest to a utility depreciation analyst are:

- Units-of-Production/Service (UOP/UOS)
- Average Life Group (ALG)
- Vintage Group (VG)
- Equal Life Group (ELG)

UOP/UOS are straight-line procedures, because productive life is not limited to being measured by time. If usage is the appropriate measure of productive life, depreciation should be straight-line over production or usage. ALG, VG and ELG are straight-line over life measured by time, with ALG utilizing average life, VG utilizing probable life, and ELG utilizing actual life. ALG is sometimes referred to as Broad Group.

Depreciation accounting literature usually utilizes group to describe a procedure, referring to ALG, VG, and ELG. This is unfortunate, as it creates confusion with the group concept of depreciation. ALG, VG and ELG merely designate rate calculations that involve unique weighting of life as part of the calculation process. ALG, VG and ELG are not separate depreciation methods.

ARM 1 suggests that UOP/UOS would conform to the objectives of depreciation accounting if there is evidence that:

- Net-revenue contributions or operating efficiency of an asset are indeterminate or tend to be proportional to use.

[2] SFAS 121 was recently superceded by SFAS 144, Accounting for the Impairment or Disposal of Long-Lived Assets.

- Discrete units of input or output (production or services) can be identified and measured.
- The incidence of events contributing to the exhaustion of usefulness relates more to use than to time.
- Other asset-related charges tend to be proportional to use.
- Total input or output can be reasonably estimated.
- Obsolescence is not a significant factor or can be reasonably estimated in relation to the estimate of total input or output.

UOP is appropriate for assets that produce or are consumed in a distinctive pattern, such as natural gas fields (mcf of production) and electric generating units (kWhr of production). UOS is appropriate for railroad rails (ton-miles of service). These procedures are sometimes used for vehicles for which depreciation is taken on a mileage basis, and for construction equipment for which depreciation is taken on an hours-of-use basis.

ARM 1 suggests that straight-line over life measured by time (ALG, VG and ELG) would conform to the objectives of depreciation accounting if there is evidence that:

- Net-revenue contributions or operating efficiency of an asset are indeterminate or tend to be relatively constant over the estimated useful life of the asset.
- The incidence of events contributing to the exhaustion of usefulness relates more to time than to use.
- Other asset-related charges tend to be relatively constant over the estimated useful life of the asset.
- The discounted value of future service potential tends to decline as a function of time rather than use.
- The interest factor is relatively insignificant or tends to be offset by other factors.
- The effect of obsolescence can be reasonably estimated.

For ALG, each property item in the depreciable group is assumed to have a life equal to that of the group. ELG recognizes that only a small portion of the items in a group retires at an age equal to the average life. For the average to exist, about half the items will retire at an age less than the average life, a small amount at the average life, and the rest at an age greater than the average. It is the retirement dispersion pattern that defines the actual life. An average service life cannot exist without some estimate of the dispersion. If the dispersion of retirements around the average life does not exist (every item retires at an age equal to the average life), the ALG rate is identical to the ELG rate. With dispersion, the ELG rate initially exceeds the ALG rate, and as the property ages eventually becomes less than the ALG rate. It is the dispersion pattern that defines the equal life component weighting utilized for the ELG rate calculation.

ARM 1 suggests that deferred procedures would conform to the objectives of depreciation accounting if there is evidence that:

- Net-revenue contributions or operating efficiency of an asset are indeterminate or, to the extent determinable, tend to be constant or to increase with the age of the asset.
- The asset is used by an enterprise that is able to price its goods or services so as to obtain a fixed rate of return on investment (for example, rates established by regulatory authorities).
- Other asset-related charges are expected to be constant or to decrease over the estimated useful life of the asset.

The accounting profession has departed from the fixed rate of return evidence through the publication of Statement of Financial Accounting Standards No. 92, *Regulated Enterprises - Accounting for Phase-in Plans* (SFAS 92), in August 1987. SFAS 92 precludes a utility from using sinking fund depreciation for financial reporting, unless it is regularly allowed by the regulator or the reporting entity adopted sinking fund prior to issuance of SFAS 71. The prohibition applies specifically to investment, but I think it also makes sense for salvage and cost of removal.

The multitude of procedures for implementing the deferred method of depreciation defies definition. This discussion will be limited to several systematic approaches that have seen use by regulated entities. ALG is deferred relative to actual life, but, even so, is usually classified for regulatory purposes as a procedure for the straight-line method. Sinking Fund and recognition of cost of removal inflation as it occurs are the deferred procedures most often used by regulated entities. Both can be used for either investment or net salvage, however, Recognition of Inflation as it Occurs is most commonly used for net salvage. Sinking Fund was used for the decommissioning of certain nuclear power plants, until internal funding was precluded by the Nuclear Regulatory Commission. Sinking Fund and Recognition of Inflation as it Occurs have been used for the negative net salvage of fossil-fuel generating plants.

Years ago, Sinking Fund received considerable use as an interim step when the utility industry discontinued use of retirement or replacement accounting and adopted depreciation accounting. Its purpose at that time was to minimize the near-term increase in revenue requirements by calculating low depreciation provisions. Since the depreciation provisions affect the rate base (through the accumulated provision for depreciation), determination of the impact of Sinking Fund on revenue requirements requires consideration of the return and income tax consequences, as well as annual depreciation provisions. Low revenue requirements with Sinking Fund is a short-term phenomenon, since the revenue requirements generated by depreciation provisions over the life of any asset are higher than if a straight-line procedure had been utilized.

The extent of the deferral for Sinking Fund varies directly with the annuity interest rate. The Straight-line and Sinking Fund depreciation rate patterns are identical when the interest rate is zero. Sinking Fund is usually implemented an annuity with periodic contributions, so when applied to net removal cost is somewhat more deferred than the proposed liability treatment when the annuity interest rate and discount rate are identical.

Sinking Fund is often calculated using the annuity interest rate that produces equal annual revenue requirements. For investment, the levelizing interest rate is the pre-tax cost of capital. For net salvage, the levelizing interest rate is the after-tax cost of capital.

When used for net salvage, Recognizing Inflation as it Occurs merely involves estimating future salvage recoveries and removal expenditures at the present price level, rather than at the price level expected at the time of occurrence. Recognition of Inflation as it Occurs is not in accordance with the definitions of salvage and cost of removal in the Uniform Systems of Accounts and has seen little direct use, except for power plants. This procedure is more deferred than is Sinking Fund.

When used for investment, Recognizing Inflation as it Occurs is one form of Economic Depreciation. The concept involves the removal of the inflation component from the cost of capital and adding an inflation component to the plant-in-service portion of rate base. The effect is to change the timing of both return on capital and return of capital. Property values are written up, annual depreciation provisions are negative in early years, and recording of depreciation expenses is deferred until the last few years of life. Regulators have yet to allow this deferred procedure to be implemented, but some have used it to provide support for other procedures for deferring the recording of costs. It is unlikely that this form of Economic Depreciation could be used for financial accounting.

The use of deferral procedures can be masked through such approaches as use of average service lives or net salvage factors known to be too high, incomplete recognition of the effect of the future construction needed to maintain the integrity of the property, or shifting an end-of-life component from depreciation during life to amortization after expenditure. The institutional constraints of regulation often encourage such actions.

Most depreciation procedures can be calculated using either the whole life or the remaining life technique. Whole life rates record investment (less net salvage) over the average life. Remaining life rates recover investment (less net salvage and the accumulated provision for depreciation) over the remaining life. When dispersion curves are utilized, the remaining life of a group of surviving assets is determined by the average service life, dispersion pattern, and age distribution of the surviving property. The only life characteristic necessary to calculate ALG whole life rates is the average service life. The life characteristics necessary to calculate ELG whole life, ALG remaining life, and ELG remaining life rates are the average service life, dispersion pattern, and age distribution of the surviving property. The dispersion pattern and age distribution would also be required for ALG whole life rates if the book reserve position is tested by comparison with the calculated theoretical reserve.

Tailoring criteria deal with objectives, such as the seven qualitative objectives in Accounting Principles Board Statement No. 4, - *relevance, understandability, verifiability, neutrality, timeliness, comparability, and completeness*. Tailoring criteria are applied following the constraining criteria, and further limit the acceptable methods, procedures and techniques. Implementing criteria are applied following the tailoring criteria, and deal with the incidence of events contributing to the exhaustion of the usefulness of the asset or group of assets.

ARM 1 lists the following constraining and tailoring criteria for establishing acceptable depreciation methods (methods, procedures and techniques) under GAAP:

Constraining Criteria

The method should be rational; that is, it should be based on reasonable and relevant data.

The method should be systematic rather than discretionary.

The method should produce periodic charges to expense rather than lump-sum write-offs.

The method should allocate a depreciable base defined in terms of historical cost.

The method should allocate the depreciable base over the life of the asset.

Tailoring Criteria

Allocate the cost of a depreciable asset in proportion to its operating efficiency or some other measure of its contribution to the business.

Allocate the cost of a depreciable asset in proportion to the incidence of events contributing to the exhaustion of its usefulness.

Recognize a decline in the service potential of a depreciable asset in the period of the decline and measure the decline in conformity with values that a rational purchaser would assign, either at the date of acquisition or at that date and periodically thereafter, to the remaining service potential of the asset. (Market value in the used-asset market may be used as the equivalent of the value that a rational purchaser would assign to the remaining service potential of an asset.)

Allocate the cost of a depreciable asset over its useful life in a manner that would tend to equalize the sum of depreciation and other asset-related costs for each year of its useful life.

Allocate the cost of a depreciable asset so as to report, other things being equal, a constant rate of return on the net investment in the asset.

The tailoring criteria include some objectives that are in conflict and not equally attainable, so tradeoffs will be necessary. The weights assigned to each criteria would vary with the circumstances. As was discussed above, SFAS 92 effectively precluded consideration of the Tailoring Criterion for equalizing the sum of depreciation and other asset-related costs by defining sinking fund depreciation as having the attributes of a phase-in plan. However, this preclusion is generally interpreted as applying only to the investment component of depreciation.

Regulatory Depreciation Accounting Definitions

The Uniform Systems of Accounts prescribed by the FERC, the NARUC, and state regulatory commissions contain several definitions applicable to depreciation. These definitions are more specific than the AICPA definition and provide a more detailed framework. The definitions below are from the FERC System for gas utilities:

> *Depreciation*, as applied to depreciable gas plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of gas plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities, and, in the case of natural gas companies, the exhaustion of natural resources.
>
> *Service value* means the difference between original cost and net salvage value of gas plant.
>
> *Original cost*, as applied to gas plant, means the cost of such property to the person first devoting it to public service.
>
> *Net salvage value* means the salvage value of property retired less the cost of removal.
>
> *Salvage value* means the amount received from property retired, less any expenses incurred in connection with the sale or in preparing the property for sale; or, if retained, the amount at which the material recoverable is chargeable to materials and supplies, or other appropriate account.
>
> *Cost of removal* means the cost of demolishing, dismantling, tearing down or otherwise removing gas plant, including the cost of transportation and handling incidental thereto.
>
> *Service life* means the time between the date gas plant is includable in utility plant in service, or gas plant leased to others, and the date of its retirement. If depreciation is accounted for on a production basis rather than on a time basis, then service life should be measured in terms of the appropriate unit of production.

The above definitions are ordered so that concepts flow from one to the next. *Value* is used in several. This is unfortunate, as it can lead untrained observers to think of depreciation as a value concept. *Service value* is specifically defined as being based on *original cost*. Depreciation accounting is for recovery of the original cost of assets, not their economic, market, or any other non-original cost measure of value. These definitions lead to recording investment costs after expenditure, credit for salvage before receipt and accrual of cost of removal before expenditure, so incorporate therein the accrual basis of accounting. This is consistent with paragraph 11 of the General Instructions of the FERC Uniform Systems of Accounts for electric and gas utilities, which states that "the utility is required to keep its accounts on the accrual basis." This requirement precludes use for regulatory accounting purposes of the cash basis for salvage and cost of removal that is sometimes proposed in regulatory proceedings.

A total of nine causes of depreciation (sometimes called forces of retirement) are listed in the depreciation definition. Of the nine, only three are physical causes (wear and tear, decay, and action of the elements). While the exhaustion of natural resources is a physical occurrence, in most situations it does not cause physical deterioration of the facilities being depreciated. The non-physical causes are more numerous and are more important to the determination of asset mortality characteristics. It is generally recognized that the majority of utility property retirements are due to non-physical causes. Non-physical causes are likely to be in current operation long before direct evidence of their existence appears. All the regulatory depreciation definition requires is that the causes "are known to be in current operation." Therefore, obsolescence is to be reflected in depreciation provisions, even if it has yet to cause any retirements. Non-physical causes are not difficult for a trained observer to identify, but are difficult to quantify and even more difficult to get regulatory bodies to recognize.

Unlike the AICPA depreciation definition for financial accounting, regulatory definitions are quite specific about including both salvage and cost of removal in depreciation accounting. More importantly, it is evident from the wording of the regulatory definitions that salvage and cost of removal are to be included at the amounts expected to be received or incurred - that is, at the price level expected at the time of receipt or incurrence. "Amount received" is stated in the salvage value definition and "cost of" is stated in the cost of removal definition. Nothing is said about current price level or present value. Accounting texts are not specific on this requirement, but it my opinion that future amounts are implied. Accounting texts often use salvage to denote salvage less cost of removal and usually say little about cost of removal, because most non-regulated entities do not expect net salvage to be far from zero. However, that perspective is changing in the wake of recognition that environmental and pollution abatement efforts can be costly. Like Uniform Systems of Accounts, this discussion uses *net salvage* to denote only *salvage less cost of removal.*

The FERC definition of *service life* is poorly worded, as the second sentence suggests that accounting drives the basis for measuring the service life. That is backward, as it is the appropriate procedure for measuring the service life that should determine the required accounting.

Regulatory Constraints

The institutional constraints imposed by regulation are of significance to depreciation analysts involved with regulated entities, as these constraints often result in depreciation rates that do not provide an accurate match between asset consumption and the recording of that consumption. The magnitude of depreciation rates is under the control of both management and regulatory policies. A significant management policy is the degree of willingness to raise issues in regulatory proceedings. SFAS 71 allows regulated entities to utilize unique accounting practices that are not available to non-regulated entities. As a result, auditors are unlikely to question the use of depreciation rates that have been authorized by a regulatory body, even though they may be inadequate, may not be both systematic and rational, or may reflect an undisclosed change in accounting circumstance, such as a cash basis for salvage and cost of removal.

Regulators are continually confronted with depreciation decisions that have both short-term and long-term influences on customers. This is because depreciation affects both the numerator and the denominator of the fraction that expresses the rate of return. The annual depreciation provision is reflected in both the determination of the amount of return (the numerator) and in the reserve for accumulated depreciation provisions used in the determination of the rate base (the denominator). The short-term influence is because the annual provision appears only once in the numerator. The long-term influence is because the accumulation of annual provisions appears in the denominator.

This phenomenon and the ultimate impact of inaccurate depreciation provisions are discussed in the 1996 edition of *Public Utility Depreciation Practices*, which states on page 23:

> The regulatory body prescribing depreciation rates is thus confronted with a decision which affects both the short-run and the long-run interests of the customer and the company. If a commission prescribes rates which yield depreciation accruals that are too low, the revenue requirement in the short run may be lower. But the requirements for income taxes and return may offset the apparent savings in depreciation expense, so service rates in the long run may be higher. If depreciation rates are set so low that revenue requirements fail to repay the capital invested in a group of property by the end of its service life, confiscation takes place or the unpaid cost remains in the rate base until amortized or expensed. On the other hand, if the regulatory body establishes depreciation rates toward the upper end of the zone of reasonableness, rates for service will be higher in the short-run, but may be lower in the long-run.
>
> It is essential to remember that depreciation rates are intended only for the purpose of recording the periodic allocation of cost in a manner properly related to the useful life of the plant. It is not intended, for example, to achieve a desired financial objective or to fund modernization programs.

Logic suggests that regulators would maintain an equitable balance between the short-term and long-term influences on customers, but the political nature of regulation often causes a tilt toward the short-term influences. The effect of such a tilt reverses rather quickly, as the revenue requirement impact of depreciation rate changes will typically reverse seven or eight years after the change was made.

Thus, the distribution of the various components of depreciation costs to the different generations of customers is controlled by the manner in which regulated entities and their regulators respond to the politics of regulation. For example, suppose that property costing $100 is installed. If the expenditure is considered to be maintenance, the recovery from customers is $100. This is the equivalent of zero life and has the lowest total revenue requirements. Capitalization adds a return and income tax component to the revenue requirements, the magnitude of which depends on the length of the life.

If the expenditure is capitalized and the life is one year, net salvage is zero, and the allowed pre-tax rate of return is 20%, the total revenue requirements are $110, as shown by Case A on Figure 1. The capital recovery component is $100 and the return and tax component of $10 is 20% of the average rate base of $50. If the life is five years, the total revenue requirements are $150, because the return and tax component increases to $50. This is Case B on Figure 1. Case C shows that the revenue requirements increase to $200 if the life is ten years, because the return and tax component increases to $100.

Using a life that is too long will temporarily decrease annual revenue requirements, but will ultimately increase both annual and total revenue requirements. The increase has a tendency to become permanent, because the property will be under-recovered at retirement. The effect of under-recovery on rate base is shown by Case D for an actual life of five years, a life for depreciation purposes of ten years and zero net salvage. As shown, retirement of the under-depreciated asset leaves a rate base of $50. The total revenue requirements will depend on how long the under-recovery situation is allowed to continue. Case B shows that the total revenue requirements would have been $150 if the correct life had been used. Case D1 shows that the situation cannot be rectified quickly enough to keep the total revenue requirements under the amount that results from the correct life (Case B). Even if the $50 of under-recovery is recovered in total in year six (Case D2), the total revenue requirements are $180, or 20% more than if the correct life had been used.

If an incorrect life causes the rate base to increase upon retirement, the increase will become permanent if not specifically compensated for. While remaining life rates are sometimes claimed to be the appropriate compensation for this situation, compensation will occur only if the remaining life of the surviving property is never over-estimated. But even with this compensation, revenue requirements are inflated. What often occurs is that the life of surviving property continues to be over-estimated, causing the rate base inflation to grow and the under-recovery to compound, which is what has caused telecommunications companies (starting with U.S. West in 1993) to discontinue use of SFAS 71 and record large asset impairments.

This situation also occurs if salvage is over-estimated or cost of removal is under-estimated. If net salvage is negative 50%, but negative 10% is used for depreciation and the property has a life of ten years, the total revenue requirements through year ten are $200, as shown by Case E on Figure 1. Case F shows that if negative 50% net salvage had been used, the total revenue requirements through year ten are also $200. However, Case E shows that a rate base of $40 remains at retirement, causing inflated revenue requirements into the future. Again, how much total revenue requirements are inflated depends on how quickly the situation is rectified. Also, the total revenue requirements can never be as low as when the basis for depreciation is correct in the first place.

Using a life that is too short or a net salvage factor that is too low (not positive enough or too negative) will produce the lowest total revenue requirements, but the nature of regulation makes this situation unlikely. However, these approaches are recognized as being *conservative accounting*, so would be looked upon favorably for financial accounting purposes.

Conclusion

Figure 1 demonstrates that depreciation deferrals have an adverse effect on customers. Therefore, it is not just the users of financial statements that benefit when depreciation analysts dealing with regulated entities have a thorough understanding of the purpose of depreciation accounting and reflect that understanding in their work.

EFFECT OF INADEQUATE DEPRECIATION RATES

Figure 1

(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Beginning Plant		Reserve							
Particu		Year	Balance $	Recovery $	Beginning $	Year End $	Retirement $	Net Salvage $	Average $	Rate Base $	Return & Taxes $	Revenue Reqmts. $
CASE A												
Original Cost	100	1	100	100	0	100	100	0	50	50	10	110
Life	1 Yr	2	0		0	0			0	0	0	0
Net Salvage	0%											
Return	20%											
											Total	110
CASE B												
Original Cost	100	1	100	20	0	20			10	90	18	38
Life	5 Yrs	2	100	20	20	40			30	70	14	34
Net Salvage	0%	3	100	20	40	60			50	50	10	30
Return	20%	4	100	20	60	80			70	30	6	26
		5	100	20	80	100	100	0	90	10	2	22
		6	0		0	0			0	0	0	0
											Total	150
CASE C												
Original Cost	100	1	100	10	0	10			5	95	19	29
Life	10 Yrs	2	100	10	10	20			15	85	17	27
Net Salvage	0%	3	100	10	20	30			25	75	15	25
Return	20%	4	100	10	30	40			35	65	13	23
		5	100	10	40	50			45	55	11	21
		6	100	10	50	60			55	45	9	19
		7	100	10	60	70			65	35	7	17
		8	100	10	70	80			75	25	5	15
		9	100	10	80	90			85	15	3	13
		10	100	10	90	100	100	0	95	5	1	11
		11	0		0	0			0	0	0	0
											Total	200
CASE D1												
Original Cost	100	1	100	10	0	10			5	95	19	29
Life	10 Yrs	2	100	10	10	20			15	85	17	27
Net Salvage	0%	3	100	10	20	30			25	75	15	25
Return	20%	4	100	10	30	40			35	65	13	23
		5	100	10	40	50	100	0	45	55	11	21
		6	0		-50	-50			-50	50	10	10
											Total	135
CASE D2												
Original Cost	100	1	100	10	0	10			5	95	19	29
Life	10 Yrs	2	100	10	10	20			15	85	17	27
Net Salvage	0%	3	100	10	20	30			25	75	15	25
Return	20%	4	100	10	30	40			35	65	13	23
		5	100	10	40	50	100	0	45	55	11	21
		6	0	50	-50	0			-25	25	5	55
											Total	180
CAES E												
Original Cost	100	1	100	11	0	11			6	95	19	30
Life	10 Yrs	2	100	11	11	22			17	84	17	28
Net Salvage	-10%	3	100	11	22	33			28	73	15	26
Return	20%	4	100	11	33	44			39	62	12	23
		5	100	11	44	55			50	51	10	21
		6	100	11	55	66			61	40	8	19
		7	100	11	66	77			72	29	6	17
		8	100	11	77	88			83	18	4	15
		9	100	11	88	99			94	6	1	12
		10	100	11	99	110	100	-50	105	-5	-1	10
		11	0		-40	-40			-40	40	8	8
											Total	208
CASE F												
Original Cost	100	1	100	15	0	15			8	93	19	34
Life	10 Yrs	2	100	15	15	30			23	78	16	31
Net Salvage	-50%	3	100	15	30	45			38	63	13	28
Return	20%	4	100	15	45	60			53	48	10	25
		5	100	15	60	75			68	33	7	22
		6	100	15	75	90			83	18	4	19
		7	100	15	90	105			98	3	1	16
		8	100	15	105	120			113	-13	-3	13
		9	100	15	120	135			128	-28	-6	10
		10	100	15	135	150	100	-50	143	-43	-9	7
		11	0		0	0			0	0	0	0
											Total	200