November 18, 2011

TO: Membership of the Society of Depreciation Professionals

FROM: John Ferguson, Current Issues Editor

The purpose of the Current Issues letters is to inform the Society membership on depreciation related issues. The views expressed in the letters are the views of the authors and do not reflect any formal position of the Society. The Society hopes that these letters will prompt discussion among members and lead to an increased understanding of the issues facing our members. All members are encouraged to submit their ideas and comments for consideration in a future letter. Comments should be addressed to John Ferguson (johnferg@swbell.net). The letters are distributed to members via email and each is posted on the SDP web site (www.depr.org). All prior Current Issues letters are posted on the members-only section of the Society web site. Therefore, any prior letter mentioned by this letter is available to members.

General Instruction 22 of the FERC Electric Uniform System of Accounts (USoA) – Comment

This is the discussion of General Instruction 22, what prompted it, and why the FERC gas USoA does not contain an equivalent that was promised by the discussions of implications of a distinctive lifecycle for the depreciation accounting of power plants in the June 17, 2011 Current Issues letter (pages 2 and 3) and of FERC Docket No. ER11-3584 of Florida Power Corporation in the August 4, 2011 letter (pages 3 and 4), and demonstrates that fully understanding the significance of General Instruction 22 is unlikely without also understanding the Notice of Proposed Rulemaking (NOPR), the resulting Order No. 618 that added General Instruction 22 to the electric USoA, and what prompted them.

The process that led to adding General Instruction 22 to the electric USoA in 2000 began with a request by Midwest Power (later becoming MidAmerican Energy) (Docket No. EL95-3-000) for a declaratory order from the FERC authorizing a reduction in depreciation rates, which was rejected. A May 15, 1997 order in Docket No. EL95-3-000 noted some apparent confusion concerning Section 302(a) of the Federal Power Act, so the Commission (1) stated it "will not require public utilities and licensees to file for formal approval of depreciation rate changes based on sound depreciation accounting practices and implemented prior to April 19, 1994" and (2) provided an amnesty period through December 31, 1997 for making the required filings for rate changes made after April 18, 1994. These actions led to an October 22, 1997 order granting a motion of Southern Company Services for intervention and denying a rehearing, and to a November 5, 1997 letter from the FERC Chief Accountant concerning what information will be required for such filings.

Southern Company (Alabama Power, et al.) appealed and the U.S. Court of Appeals for the D.C. Circuit agreed that the Federal Power Act provides authority to promulgate a rule to describe how utilities should record their depreciation expenses, but overturned the preemption, because the FERC has chosen to not promulgate such a rule and to deal

with depreciation case-by-case. The FERC's reaction to the D.C Circuit's November 13, 1998 decision was to open a NOPR on July 29, 1999 (Docket No. RM99-7-000) that resulted in Order No. 618 on July 27, 2000 that added General Instruction 22 to the electric USoA.

There is no equivalent to General Instruction 22 in the FERC gas USoA, which I believe is a consequence of the structures of the electric and gas industries being different. The electric industry is vertically integrated, which makes most entities subject to both FERC and state regulation and prompts General Instruction 22. The gas industry is not vertically integrated, which makes entities subject to either FERC or state regulation, but not to both, and precludes the need for broadly applicable depreciation guidance by the FERC.

The stated intent of Docket No. RM99-7-000 was "to amend its regulations to set forth uniform standards based on the straight-line method of depreciation and the assets' estimated useful service lives for determining depreciation for accounting purposes," and the NOPR states:

> In light of Alabama Power, we decide here to proceed with a rulemaking to establish the principles that public utilities and licensees subject to Part 101 must follow in determining depreciation rates for accounting purposes. We are not proposing to ascertain, determine, and fix individual company depreciation rates as part of this rulemaking. Instead, we provide a regulatory framework for monitoring depreciation accounting practices and for taking action in individual cases if and when the need arises -- to ensure that public utilities' and licensees' books reflect proper depreciation amounts. (footnote numbers excluded)

The NOPR proposed to add the following to the General Instructions of the electric USoA:

> 22. Depreciation Accounting
>
> A. Method. Utilities must use the straight-line method of depreciation. The straight-line method allocates equal amounts of the service value of utility property to expense during each year of the property's useful service life.
>
> B. Service lives. Estimated useful service lives of depreciable property must be supported by engineering or other depreciation studies.
>
> C. Rate. Utilities must use percentage rates of depreciation that are based on the straight-line method and the estimated useful service lives of depreciable property. Where composite depreciation rates are used, they should be based on the weighted average estimated useful service lives of the depreciable property comprising the composite group.

However, Order No. 618 made the following addition to the USoA:

> 22. Depreciation Accounting.

> A. Method. Utilities must use a method of depreciation that allocates in a systematic and rational manner the service value of depreciable property over the service life of the property.
>
> B. Service lives. Estimated useful service lives of depreciable property must be supported by engineering, economic, or other depreciation studies.
>
> C. Rate. Utilities must use percentage rates of depreciation that are based on a method of depreciation that allocates in a systematic and rational manner the service value of depreciable property to the service life of the property. Where composite depreciation rates are used, they should be based on the weighted average estimated useful service lives of the depreciable property comprising the composite group.

The underlines above indicate the portions of the NOPR and Order No. 618 that differ, and demonstrate that the major difference is the shift from *straight-line* to *systematic and rational*.

Order No. 618 shows that the NOPR prompted comments from the American Institute of Certified Public Accountants, three accounting firms, the National Association of Regulatory Utility Commissioners (NARUC), two state commissions, the National Rural Electric Cooperative Association, one electric cooperative, the Edison Electric Institute (EEI), and 11 investor owned utilities. The overwhelming majority of the comments agreed with the proposal to not require individual utilities to file their accounting depreciation rates for the FERC's approval, i.e., no FERC preemption, and strongly opposed adopting the straight-line method to the exclusion of other methods that also result in systematically and rationally allocating the cost of utility property to periods of use. Only the NARUC and the Florida Public Service Commission supported exclusive use of the straight-line method.

Those in opposition to straight-line asserted the need to allow accelerated methods – an example being the EEI, for which Order No. 618 states:

> EEI submits that the proposed adoption of a straight-line depreciation method of accounting does not meet the reporting needs of a changing industry and runs counter to the Commission's efforts to promote efficient competition by reducing the regulatory and accounting burden of utilities. EEI also observes that the NOPR's proposal for universal straight-line depreciation is inconsistent with the Commission's recent Order No. 2000, in which the Commission indicated that it would consider the application of accelerated depreciation for new transmission investment. (footnote numbers excluded)

While not stated by Order No. 618, the EEI comments include a reference to Order No. 598, Units of Property Accounting Regulations, as being an example of addressing an unnecessary regulatory burden. Order No. 598 eliminated Parts 116 (electric) and 216 (gas) of Title 18 of the Code of Federal Regulations that specified the maximum size of the property retirement units that can be utilized for accounting purposes, and substituted a requirement that each jurisdictional entity maintain and consistently utilize its own retirement unit definitions. I observed Parts 116 and 216 to be difficult to deal with,

because of an extremely wide range of sizes of some of the defined property units (i.e., replacement of a $10,000 motor would be capitalized, but replacement of a $2,000,000 generator rotor would be expensed) and because some definitions were too vague for consistent application. Back when the FERC was conducting generalized compliance audits, vague definitions often led to compliance issues. However, such audits are no longer being conducted, and I believe they ceased prior to Order No. 598 being issued.

Order No. 618 states "The broader systematic and rational standard will ensure that depreciation for accounting purposes is done properly while at the same time allowing flexibility in a changing business environment." While recognizing that this additional flexibility could create a potential for abuse, the FERC stated a belief that it's monitoring of utility depreciation practices will mitigate this potential, so utilities will not be required to make separate filings to obtain FERC approval before implementing changes in depreciation rates for accounting purposes, i.e., no preemption.

The comments of Detroit Edison referred to in Order No. 618 are particularly interesting, because Edison notes that straight-line defers the recognition of certain costs to future years. Edison's reference to deferral to future years seems to be directed at the average life group (ALG) procedure that presumes each component of a depreciable group is retired at an age equal to the average service life of the group. The existence of the retirement dispersion that causes equal life group (ELG) and ALG rates to differ demonstrates that this presumption of age at retirement is false, which results in group components retired at ages lower than average service life being under-depreciated by ALG and compensated for by over-depreciating components retired at ages higher than average service life. If so, the FERC shifting from *straight-line* in the NOPR to *systematic and rational* in Order No. 618 might be interpreted as giving recognition of the validity of ELG procedure that causes all retirements to be fully depreciated, no matter at what age they occur.

Some observations concerning General Instruction 22 –

> For average life property, shifting from *straight-line*, as proposed by the NOPR, to *systematic and rational* in Order No. 618 and General Instruction 22 was intended to allow depreciation for regulatory purposes that is accelerated relative to service life.
>
> Service life can be defined by either time or asset usage, and General Instruction 22 allows both.
>
> While General Instruction 22 states that depreciation is to utilize percentage rates, the Units-of-Production (UOP) procedure may be best applied as a formula. I do not believe that this Instruction is intended to prevent utilizing UOP as a formula. However, UOP is more likely to be utilized by gas utilities than by electric utilities.
>
> Entities that practice the component (unit) concept of depreciation accounting typically adopt depreciable lives shorter than are expected, in order to limit the extent of recorded losses, thereby accelerating the recording of depreciation. This practice is accepted as being

"conservative" accounting, whereas deferral would be considered to be in conflict with GAAP.

ALG, ELG, and UOP are considered to be straight-line, so would have been appropriate under the NOPR's proposal, with ALG being straight-line over a calculated average service life, ELG being straight-line over the actual life defined by the pattern of retirement dispersion, and UOP being straight-line over life defined by usage. (ALG and ELG rates are identical when there is no dispersion, such as occurs when the concept known as General Plant Amortization is utilized.)

Being *rational* requires the pattern of recorded depreciation to match the pattern of asset usage or revenue generation, and is required by both General Instruction 22 and U.S. GAAP. Since the ALG presumption of each component being retired at an age equal to the average service life is false when retirement dispersion exists, ALG is not *rational* relative to actual life, but is rational relative to the calculated average life.

The requirement for being *systematic and rational* is particularly significant for life span property, such as power plants and pipelines.

> For power plants, it is not unusual for regulation to result in their depreciation rates increasing over their lifetimes. This situation is commonly a consequence of reflecting in depreciation rates generating unit retirement dates that can be reached only by making future capital expenditures for replacing components, for adding components not previously existing, for refurbishment, or for repowering through boiler replacement, but reflecting the needed expenditures only after they have been incurred. This mismatch usually causes the rates to increase at each future recalculation, whereas the asset usage is either relatively constant or decreasing, so is in conflict with General Instruction 22.
>
> Steam generating units designed for base load operation commonly have their life spans extended by shifting to a peaking or standby mode of operation late in life, by refurbishment, or by repowering through boiler replacement. Shifting the mode of operation causes a distinctive lifecycle, whereby usage decreases substantially at the time of the shift. Being *rational*, as is required by General Instruction 22, dictates that the depreciation rates also decrease at the time of the shift. How to determine such rates is beyond the scope of this discussion.
>
> Whether refurbishment or repowering can be justified is determined by an assessment of equipment condition that typically occurs when a unit is 25 to 30 years old. Two basic approaches are available for dealing with refurbishment or repowering for depreciation purposes in a manner consistent with General Instruction 22. One approach is to reflect neither the extended life nor the related expenditures in depreciation rates until the

> condition assessment is conducted, and then to reflect both the life extension and estimates of the related expenditures in the rates, if the assessment determines that life extension is justified. The other approach is to reflect both the extended life and related expenditures in the rates from day-one. However, this later approach is unlikely to be practical, because the extent (or even the existence) of the life extension and expenditures is unknown until quantified by an assessment of condition.
>
> Pipelines have typically been expected to experience decreasing annual throughput, suggesting a decreasing pattern of depreciation rates. However, the recently developed ability to produce gas from shale formations can be expected to have a significant impact on this situation, because the domestic natural gas reserves are now expected to last longer than the physical life of the pipe. The influence of this new source of gas is likely to be unique to each entity or pipeline, and will require careful consideration when conducting future depreciation studies.

General Instruction 22 being a consequence of a failed effort by the FERC to assert preemption has not prevented parties in FERC proceedings from sometimes evoking General Instruction 22 and at the same time asserting that preemption precludes the FERC Form 1 Reports of jurisdictional enterprises from including depreciation expenses and reserves reflecting depreciation rates authorized by retail jurisdictions. While not valid, any such preemption would result in the depreciation expenses and reserves in Form 1 Reports being different from the expenses and reserves reflected in regulatory accounting and financial reporting, and would likely cause confusion among users of electric utility accounting information.

Some Potential Influences on the Depreciation Accounting for Generation Resources

This discussion relies mostly on a recent Electric Light & Power e-article, *EPA Regulations Affect Coal*, and on *Global Gas Glut* in the September 2011 issue of Power.

EPA Regulations Affect Coal states that the environmental issues most coal stations face are:

> Near-term air quality regulations that are poised to take effect in the next two years; and,
>
> Upgrades or conversions of water and waste management systems by the end of the decade, as well as lingering uncertainty related to potential future greenhouse gas regulations.

The new EPA regulations affecting coal generation are listed as being:

> Utility Maximum Achievable Control Technology rules to reduce emissions of hazardous air pollutants, such as mercury;

The Clean Air Transportation Rule to reduce ozone and particulate levels via control of nitrogen oxides and sulfur dioxide emissions;

Regional haze standards to improve visibility via reduction of nitrogen oxides, sulfur dioxide, and particulates;

National Ambient Air Quality Standards with stricter revised standards for nitrogen oxides, sulfur dioxide, carbon monoxide, ozone, and fine particulates;

Designation of combustion residues (ash) as either solid or hazardous waste;

Cooling water intake design and wastewater discharge standards; and,

Greenhouse gas cap and trade.

EPA Regulations Affect Coal asserts that it is now is the time for utilities to begin making their assessments of the impact of these regulations.

> Comment: The substantially increased U.S. natural gas reserves resulting from the recently developed ability to produce gas from shale formations and recent regulatory reactions to objections to certain regulations will be significant to assessments of the impact of environmental regulations and their depreciation implications. A significant aspect of the implications of environmental regulations is recognition that multiple regulations apply to each facility, which causes their impact to compound.

The ability to produce natural gas from shale deposits has substantially increased U.S. natural gas reserves, and *Global Gas Glut* states that the U.S. Energy Information Administration (EIA) says shale gas has increased from being only 4% of U.S. gas production prior to 2005 to comprising about 30% for 2011 through May and is predicting that shale gas will comprise nearly half of the U.S. production by 2035 and will cause gas imports to drop to nearly zero by that time. The shale gas will keep U.S. natural gas prices low for the foreseeable future, which, together with its low CO_2 emissions relative to coal, will make gas the preferred generation fuel and keep electricity prices low, thereby (1) undermining the economics of renewable and nuclear projects and of moving natural gas from Alaska across Canada and into the U.S., and (2) providing a quicker and less expensive path for decreasing emissions than would be available from retrofitting solid fuel plants.

> Comment: Recent gas discoveries have prompted Mexico to plan on substituting natural gas for ten previously planned nuclear units, but I do not know whether these discoveries are in shale formations.

A Penn State study is said to have found that new gas supplies have already reduced energy expenditures in Pennsylvania, which is in the heart of the Marcellus shale formation. The Marcellus formation underlying parts of New York, Pennsylvania, and West Virginia is one of the largest shale formations in the U.S., and an even larger formation (Utica) is know to be under it and to underlay parts of eight states, two of the great lakes, and two Canadian provinces.

The massive U.S. shale formations have long been known, but the recently developed ability to produce them economically has been a game changer. However, producing them is not without controversy, and there are differences of opinion about the magnitude of the shale gas reserves. For example, New Jersey, which lacks shale gas reserves, has banned the hydraulic fracturing that is required to produce shale formations, and the EIA and the U.S. Geological Survey differ on the magnitude of the producible reserves.

> Comment: Environmental concern is not the only deterrent to producing shale formations. Low prices influence the availability of financing, which is prompting efforts to gain financial strength through mergers and acquisitions. As is evident from the discussion in the next section of this Current Issues letter of a recent briefing by the Edison Electric Institute, gaining financial strength has also been a factor in recent electric utility mergers.

Shale gas is often found in conjunction with crude oil and/or natural gas liquids, both of which have market values high enough to result in the gas being essentially free. If natural gas is substituted for renewable sources, the low gas prices will change the economics and operations of gas-fired generating units built during the 1980s and 1990s that are now idle or not operating at peak efficiencies. In fact, there is already evidence in some areas of gas-fired units moving far enough up in the dispatch order to operate ahead of coal-fired units.

The potential for exporting shale gas in the form of liquefied natural gas (LNG) would be significant to U.S. and European national security, because supplying LNG to Europe would reduce the petro-power of Iran, Russia, and Venezuela. Owners of some U.S. LNG import terminals that were built during a period when U.S. reserves were decreasing are already making plans to convert them to export terminals. There is also the potential for shale gas to be utilized for transportation purposes, and shale gas producer Chesapeake Energy Corporation has announced an intention to build compressed natural gas fueling stations along major U.S. truck routes. While not mentioned by *Global Gas Glut*, the BP Group (British Gas) recently agreed to a 20-year contract to buy LNG for the Asian and European markets from a yet to be constructed facility on the Gulf Coast, and several projects are in progress to export LNG from Canada for the Asian market. The BP deal is interesting, because BP was once one of the major importers of LNG into the U.S.

> Comment: I had expected nuclear to serve as the intermediate fuel until energy storage technologies are developed sufficiently for solar to be economical in the U.S. without subsidy. However, it now looks like shale gas will serve this purpose.
>
> Shifting from solar and wind resources to resources fueled by shale gas would cause a shift from transmission of electricity to transmission of gas that would likely be easier to deal with, because the regulatory environment for siting gas pipelines is different from the environment for electric transmission lines. The Energy Policy Act of 2005 was intended to simplify electric line siting through establishing a new federal

framework under certain conditions. However, judicial proceedings have prevented this framework from beginning to function. Therefore, the regulatory environment for siting pipelines remains more friendly than the environment for electric lines.

The European Union (EU) is also blessed with large quantities of shale gas, but they are not equally distributed among the countries and are deeper than the U.S. reserves, so will be more expensive to produce. The 27 EU countries are:

Austria	Belgium	Bulgaria*	Cyprus	Czech Republic*
Denmark*	Estonia	Finland	France	Germany
Greece	Hungary*	Ireland	Italy	Latvia*
Lithuania*	Luxembourg	Malta	Netherlands	Poland*
Portugal	Romania*	Slovakia	Slovenia	Spain
Sweden*	United Kingdom*			

* indicates a country that has not adopted the euro as its currency

EU gas prices are currently double or triple the current U.S. prices, and the existence of EU shale gas is unlikely to change this relationship by much. EU countries are poor in conventional gas resources, which makes them beholding to Russian pipelines for nearly 25% of their current needs, and depending on gas imports is likely to continue, because several EU countries are curtailing nuclear generation and/or have taken the political position that drilling for unconventional sources is environmentally unacceptable and have prohibited such drilling. Therefore, the U.S. being able to keep its natural gas price advantage over the EU through producing its shale gas will provide the U.S. with what could be a substantial competitive advantage in the world economy.

Comment: Norway has significant conventional gas reserves that supply nearly 25% of the EU countries gas needs, but is not in the EU.

Edison Electric Institute (EEI) Briefing of the Financial Community on the Future Outlook of the Power Sector

This recent briefing identified three potential "game changers" – environmental policy, shale gas, and smart grid technology – and addressed the following subjects:

Federal political landscape;

Capital expenditures;

FERC transmission and reliability activities;

Smart grid technology; and,

Environmental regulations and their implications.

The EEI presents an electric industry that has embarked upon a major investment cycle that will require an increased number of rate cases and price increases, and suggests the following innovative regulatory policies and mechanisms as being needed to deal with this situation:

Future test years;

Tracker/rider mechanisms;

Construction work in progress (CWIP) in rate base

Decoupling;

Formula rate plans; and,

Performance-based rate plans.

> Comment: Society members may be interested in the discussion of these policies and mechanisms in the October 2011 Public Utilities Fortnightly article, *Updating the Utility Compact*, by EEI Executive Vice President, David Owens. All of these policies and mechanisms have seen prior use, but some have proved in the past to not be politically acceptable. For example, allowing CWIP in rate base, thereby recovering asset financing costs over the period of construction rather than over the period of use, is beneficial to ratepayers, but has been precluded by legislation or practice in some states. This benefit is a consequence of the financing cost being added to the cost of the asset when recovery is not allowed during construction. The resulting rate base increase adds a cost component for return and related income taxes over the useful life of the asset that can be thought of as forcing ratepayers to pay for financing costs multiple times when CWIP is not allowed in rate base.

The briefing shows U.S. transmission investment as decreasing from 1990 through 1998, more than tripling since, and continuing to increase over the next several years.

> Comment: I view the ability to construct transmission lines as being a key indication of the success of the restructuring of the electric industry. While there have been some problems in meeting transmission needs, the EEI data suggest that transmission line construction has occurred since restructuring and will continue.

About one-third of the slides of the briefing relate to environmental regulations and their implications. The environmental regulations addressed by the briefing are the same as listed by the e-article, *EPA Regulations Affect Coal*, discussed by the prior section of this Current Issues letter. The EEI shows the U.S. as being comprised of ten regions, of which seven relied upon coal for 30% or more of their electricity during 2009.

The briefing notes five significant electric utility mergers during 2010 and 2011, four of which were prompted, at least in part, by an interest in gaining financial strength.

> Comment: This quest for financial strength is occurring after such strength has deteriorated substantially as a consequence of utility bond ratings being lowered. For example, the article, *Restoring the Financial Balance*, in the November 2011 Public Utilities Fortnightly asserts that 90% of U.S. electric and gas utilities had bond ratings of A or higher in 1970 and that only 27% did in 2011. The article attributes this situation to

a change in the balance of the Regulatory Compact, and suggests fixing the imbalance through use of the same innovative regulatory policies and mechanisms discussed in the EEI briefing and by the previously mentioned October 2011 Fortnightly article, *Updating the Utility Compact*.

Release 28 of Accounting for Public Utilities

Accounting for Public Utilities is published by Matthew Bender & Company and is written and updated annually by Deloitte & Touche, with Release 1 having been published in 1983. Release 28 modified Chapter 6 (Public Utility Depreciation) by adding a discussion of dealing with book reserve excesses and deficiencies, adding an illustration of how the theoretical reserve calculation is used to test the adequacy of the existing book reserve, and incorporating clarifications and more current data in the nuclear decommissioning discussion. Prior releases dealt with reserve differences in Chapter 12 (Relationship of Rate Regulation to General Accepted Accounting Principles), and the discussion in Chapter 12 of Release 28 is more extensive than in Chapter 6.

The theoretical reserve calculation illustration relies on the prospective method and the following formula:

(100 – Net Salvage) x (1- (Average Remaining Life/Average Service Life))

Comment: I have observed the prospective method to not be well understood, so it is addressed by the next section of this Current Issues letter.

The Prospective Theoretical Reserve Calculation Method – Comment

The discussion in the prior section of this Current Issues letter notes my belief that the prospective method for calculating a theoretical reserve is not well understood, which prompts this discussion. The following formula is commonly utilized for the prospective method:

(100 – Net Salvage) x (1- (Average Remaining Life/Average Service Life))

Accounting for Public Utilities derives this formula from the proposition that the theoretical reserve for a depreciable property group is the amount to be recovered (depreciable plant balance less average net salvage) minus the amount remaining to be recovered (depreciation rate times remaining life) through substituting the whole life rate formula for the rate portion of the amount-remaining-to-be-recovered element. This derivation demonstrates that average net salvage and a whole life rate are inherent in the prospective method. The reserve test is described by Accounting for Public Utilities as being "rough at best," because a book reserve reflects the past, whereas a theoretical reserve reflects an expected future that is unlikely to be identical to the past.

An aspect of being "rough at best" not mentioned by Accounting for Public Utilities is that past net salvage commonly serves as the basis for the rates resulting from a depreciation study, whereas the above theoretical reserve calculation formula requires

average net salvage. Past net salvage is nearly always more positive or less negative than is average net salvage, due to the sensitivity of salvage and cost of removal ratios to the age of retirements and to the age of past retirements being lower than the expected age of future retirements.

When past net salvage is reflected in depreciation rates and the average net salvage is different, the above formula is not useful. However, the formula reflecting the proposition of being the amount to be recovered minus the amount remaining to be recovered, from which the above formula is derived, is useful for this situation, through reflecting average net salvage in the amount-to-be-recovered element and reflecting depreciation rates based on past net salvage in the amount-remaining-to-be-recovered element. When past net salvage has also been reflected in prior depreciation rates, use of the formula reflecting the proposition for this situation is likely to indicate a reserve deficiency that could be substantial.

A common reaction to calculated reserve differences is to adopt remaining life depreciation rates. However, remaining life rates will not compensate for a reserve difference that is caused by the past net salvage reflected in whole life rates being different from average net salvage, unless the adoption of remaining life rates includes reflecting in them the future net salvage that is supposed to be utilized for calculating remaining life rates.

It is not difficult to utilize knowledge of the age of past retirements as the basis for using past salvage and cost of removal experience to estimate the average net salvage needed to calculate whole life depreciation rates or the future net salvage needed to calculate remaining life rates, but doing so is beyond the scope of this discussion. Calculating the age of past retirements is simple when aged data are used for life analysis purposes, and such calculations are incorporated into some depreciation software. Retirement age calculations are not so simple when unaged data are used, because the age distribution must be simulated, and I have never encountered depreciation software that incorporates this calculation.

I view the confusion concerning the prospective method as being evident in the 1968 and 1996 versions of the NARUC publication, Public Utility Depreciation Practices, and in Depreciation Systems by Wolf and Fitch. Both versions of the NARUC publication state the same theoretical reserve proposition noted above, but they both show the amount-to-be-recovered element as reflecting future net salvage rather than average net salvage, even though they recognize the theoretical reserve as reflecting a whole life depreciation rate. Depreciation Systems does something somewhat similar when the difference between average and future net salvage is significant by including a subtraction of this difference in the formula.

When the average and future net salvage are identical, substituting the conventional remaining life rate formula for the depreciation rate in the amount-remaining-to-be-recovered element of the proposition causes the theoretical reserve to be equal to the book reserve. This is consistent with a remaining life rate being a whole life rate that is adjusted for the difference between the book and theoretical reserves, which is how

depreciation analysts typically view a remaining life rate, and there is an alternative remaining life rate formula that does so. However, the sensitivity of salvage and cost of removal ratios to the age of retirements typically causes future net salvage ratios to be less positive or more negative than are average net salvage ratios, because the probable life (age plus remaining life) of a depreciable property group is higher than the average service life when retirement dispersion exists. How much the probable life exceeds the average service life depends upon the width of the dispersion pattern and the age of the surviving plant balance. For example, the Iowa S2 pattern with ages of retirements one-third and two-thirds of the average service life causes the probable lives to exceed the average service life by 1% and 9%, respectively. This situation complicates things, so it is easier to understand and explain the prospective method by presuming that there is no difference between future and average net salvage ratios.

The conventional remaining life rate formula is:

Rate = (Plant Balance - Future Net Salvage - Book Reserve)/Average Remaining Life

The alternative remaining life rate formula is:

Rate = Whole Life Rate - (Book Reserve - Theoretical Reserve)/Average Remaining Life