Public Utility

Depreciation Practices

August 1996

Compiled and Edited by

Staff Subcommittee on Depreciation of

The Finance and Technology Committee

of the

National Association of Regulatory Utility Commissioners

Published by

National Association of Regulatory Utility Commissioners
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Washington, DC 20005
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Costs may also be distributed over production rather than over service life. This method, the unit of production method, distributes the costs as units are produced using a rate per unit developed from the total estimated units to be produced. It is similar to the straight-line method but is a function of production rather than a function of time.

Salvage Considerations

Under presently accepted concepts, the amount of depreciation to be accrued over the life of an asset is its original cost less net salvage. Net salvage is the difference between the gross salvage that will be realized when the asset is disposed of and the cost of retiring it. Positive net salvage occurs when gross salvage exceeds cost of retirement, and negative net salvage occurs when cost of retirement exceeds gross salvage. Net salvage is expressed as a percentage of plant retired by dividing the dollars of net salvage by the dollars of original cost of plant retired. The goal of accounting for net salvage is to allocate the net cost of an asset to accounting periods, making due allowance for the net salvage, positive or negative, that will be obtained when the asset is retired. This concept carries with it the premise that property ownership includes the responsibility for the property's ultimate abandonment or removal. Hence, if current users benefit from its use, they should pay their pro rata share of the costs involved in the abandonment or removal of the property and also receive their pro rata share of the benefits of the proceeds realized.

This treatment of net salvage is in harmony with generally accepted accounting principles and tends to remove from the income statement any fluctuations caused by erratic, although necessary, abandonment and removal operations. It also has the advantage that current consumers pay or receive a fair share of costs associated with the property devoted to their service, even though the costs may be estimated.

The practical difficulties of estimating, reporting, and accounting for salvage and cost of retirement have raised questions as to whether more satisfactory results might be obtained if net salvage were credited or charged, as appropriate, to current operations at the time of retirement instead of being provided for over the life of the asset. The advocates of such a procedure contend that salvage is not only more difficult to estimate than service life but, for capital intensive public utilities, it is typically a minor factor in the entire depreciation picture. The obvious exception, of course, is the huge retirement cost of decommissioning nuclear power plants. The advocates of recording salvage at the time of retirement further contend that salvage could properly be accounted for on the basis of known happenings at the date of retirement rather than on speculative estimates of factors, such as junk material prices, future labor costs, and environmental remediation costs in effect at the time of retirement.

One of the practical difficulties of estimating net salvage is that reported salvage is a mixture of salvage on items retired and reused internally, salvage on items sold externally as functional equipment, and salvage on items junked and sold as scrap. Because the likelihood of reuse is greater for items that are retired at early ages, the historical salvage is usually higher than the future salvage to be realized when the account begins to decline and there is little opportunity for reuse. Therefore, under these circumstances, book salvage may overstate the average salvage realized over the entire life of the account. This has led to the proposal to redefine net salvage and retirements to eliminate the effect of reused material. Reuse salvage is further discussed in Chapter III.

The sensitivity of salvage and cost of retirement to the age of the property retired is also troublesome. Due to inflation and other factors, there is a tendency for costs of retirement, typically labor, to increase more rapidly than material prices. In an increasing number of instances, the average net salvage is estimated to be a large negative number when expressed as a percentage of original cost, sometimes in excess of negative 100%. This may look unrealistic but is appropriate and necessary so that the required cost allocation occurs. Nonetheless, a careful analysis of retirements should be made to determine if such large negative net salvage values are due to unusual circumstances. An example is the retirement of old cast iron gas mains in congested metropolitan areas. Due to urban renewal, a utility may have a significant amount of such activity for a few years. Since most of the investment in this account may now be in plastic mains in rural or suburban areas where access is easier, the removal of old cast iron gas mains at today's cost may not be representative of the costs that can be expected for plastic mains.

While this situation should not impose insurmountable difficulties from a depreciation expense or cost allocation perspective, it presents an interesting problem from the standpoint of the rate base. Since rate base is generally the difference between book cost and accumulated depreciation, the provision for negative salvage further decreases the rate base. If the original book cost for old plant is less than the accumulated provision for depreciation, the rate base could be a negative amount.

As the foregoing discussion indicates, gross salvage, in contrast to service life, is usually small in its overall effect on calculating a depreciation rate. Cost of retirement, however, must be given careful thought and attention, since for certain types of plant, it can be the most critical component of the depreciation rate.

Group Plan

The group plan of depreciation accounting is particularly adaptable to utility property. Rather than depreciating each item by itself (unit depreciation) or depreciating one single group containing all utility plant, a group contains homogeneous units of plant which are alike in character, used in the same manner throughout the utility's service territory, and operated under the same general conditions.

Of course there will be different lives for individual units within groups. For example, poles are generally combined in a single group. Some poles will be retired because of storms or automobile accidents. Some will decay, some will be displaced due to road relocations and some will be retired because of underground replacements. However, they are combined in the same group because they are homogeneous units. Years ago when some poles were untreated, there was a need for a separate grouping as these poles were more susceptible to decay and termite infestation than treated poles. Likewise, concrete poles have unique characteristics and qualify to be grouped separately from wood poles. Buried, aerial, and underground (in conduit) cables are further examples of the same type of plant receiving different grouping because of

CHAPTER XI

ESTIMATING SALVAGE AND COST OF REMOVAL

General

A general discussion of salvage and cost of removal is presented in Chapter III. Before discussing the process of analyzing and estimating these factors, a review of definitions and discussion of general principles is presented below.

When depreciable plant facilities are retired from service and physically removed, costs may be incurred and/or cash or other value may be realized if they are sold or retained for reuse. The abandonment of utility property in place can also cause costs to be incurred, (e.g., the cost of filling an abandoned gas pipe line with an inert gas). The term gross salvage refers to the amount received for retired property sold or junked, reimbursement received from insurance or other sources, or the amount at which reusable material is charged to a utility's Material and Supplies Account.[1] Cost of removal is the expenditure incurred in connection with retiring, removing, and dispersing of property. Net salvage is the difference between gross salvage and cost of removal.

Historically, most regulatory commissions have required that both gross salvage and cost of removal be reflected in depreciation rates. The theory behind this requirement is that, since most physical plant placed in service will have some residual value at the time of its retirement, the original cost recovered through depreciation should be reduced by that amount. Closely associated with this reasoning are the accounting principle that revenues be matched with costs and the regulatory principle that utility customers who benefit from the consumption of plant pay for the cost of that plant, no more, no less. The application of the latter principle also requires that the estimated cost of removal of plant be recovered over its life.

Some commissions have abandoned the above procedure and moved to current-period accounting for gross salvage and/or cost of removal. In some jurisdictions gross salvage and cost of removal are accounted for as income and expense, respectively, when they are realized. Other jurisdictions consider only gross salvage in depreciation rates, with the cost of removal being expensed in the year incurred.

Determining a reasonably accurate estimate of the average or future net salvage is not an easy task; estimates can be the subject of considerable discussion and controversy between regulators and utility personnel. This is one of the reasons advanced in support of current-period accounting for these items. When estimating future net salvage, every effort should be made to ensure that the estimate is as accurate as possible. Normally, the process should start by

[1] Regulatory agencies generally require that reusable material consisting of retirement units be salvaged at original cost, while minor items may be salvaged at current prices new. Some regulatory agencies take into consideration the fact that depreciation has been sustained.

analyzing past salvage and cost of removal data and by using the results of this analysis to project future gross salvage and cost of removal.

When performing an analysis of net salvage data, certain considerations should be kept in mind. Generally, if transfers or sales of plant have contributed significantly to realized salvage, and such transactions are considered to be unrepresentative of the future, these transactions should be eliminated from the data. If the account consists of several categories of plant, such as several radically different types and sizes of buildings, the realized salvage should be analyzed to determine whether the related retirements are a representative cross-section of the account. The age of the retired plant, market conditions prevailing at the time of retirement, company policy regarding reuse in the past, environmental remediation costs, and reimbursements in instances of damage, condemnation or forced relocation resulting from highway construction should all be considered in preparation for projecting future net salvage.

It is frequently the case that net salvage for a class of property is negative, that is, cost of removal exceeds gross salvage. This circumstance has increasingly become dominant over the past 20 to 30 years; in some cases negative net salvage even exceeds the original cost of plant. Today few utility plant categories experience positive net salvage; this means that most depreciation rates must be designed to recover more than the original cost of plant. The predominance of this circumstance is another reason why some utility commissions have switched to current-period accounting for gross salvage and, particularly, cost of removal.

Analysis and Forecast

Data relative to gross salvage and cost of removal associated with past retirement of plant can be obtained from a variety of sources; the depth of the necessary analysis will depend on the particular circumstances surrounding the past retirement of plant from the account under analysis. Generally, a first cut can be obtained from data found in the utility's annual report filed with the state regulatory commission; that data should replicate the data contained in the utility's Depreciation Reserve or Accumulated Depreciation account records. The utility, however, may subdivide primary accounts into two or more classifications for depreciation purposes, while the data contained in its annual report to the regulatory commission may be for the entire primary account.

Frequently it is necessary to go beyond the summary information contained in utility annual reports. Internal utility reports that provide monthly and cumulative data on retirements, gross salvage, and cost of removal by sub-account or depreciation category are usually available. Review of these records, particularly monthly records, can be of great benefit in isolating the circumstances surrounding apparently abnormal data. It may be necessary to review specific work orders or estimates to determine whether particular data is correct and/or representative of the category and future activity. If the utility is using retirement work orders, and is using them properly, the salvage and cost of removal amounts appearing in a utility's Accumulated

Depreciation account will be related to retirements of plant recorded simultaneously.[2] It is cautioned, however, that this is frequently not the case, with the result being that plant retirements are recorded in one time period and the associated gross salvage and cost of removal are recorded in a different time period. The impact of this timing mismatch can be largely negated by analyzing a band of years, as discussed below. Another point to consider when gathering data for analysis is that changes may have occurred in the composition of plant accounts. For example, the Federal Communications Commission's Uniform System Of Accounts for telephone corporations was revised effective January 1, 1988; and both the title and content of many plant accounts changed.

Once the source of information is established, the analysis of data can commence to determine the past relationship of net salvage to retirements, i.e., net salvage as a percent of plant retired for each of the depreciation categories being studied. Net salvage can be directly analyzed as a percent of retirements. However, in order to obtain a clear understanding of the composition of net salvage and the forces that cause it to change from year to year, generally it is best to analyze gross salvage and cost of removal separately as a percent of retirements. In making this analysis it is common to look at data for bands of years, such as 1988-93, 1989-94, 1990-95, etc. These bands may, or may not, coincide with the bands used in making the life analysis. They should be just broad enough so a fairly smooth trend can be detected, if one exists. If retirements are few or erratic from one period to another, it will be necessary to use a wider band. As a general rule, the greater the retirement activity, the shorter the band necessary for analysis, and vice versa. Also, the shorter the service life, the shorter the band needed, and vice versa. If the band is too long, it may mask any trend. However, with certain long-lived property, such as conduit and buildings, in order to obtain meaningful results it is usually necessary to examine data for a wide band of years, perhaps 20 or 30 years.

In many cases both gross salvage and cost of removal trend in the same direction so net salvage remains fairly steady. Quite often, when plant is removed with the intent of reusing it, the gross salvage is high but because of the extra care required to recover the plant in good condition, the cost of removal is also high. If the plant removed is old or obsolete, the gross salvage is low. In this case however, the cost of removal is also likely to be low since relatively less care is likely to be taken in the removal process.

Past trends should not be the sole guide in predicting future net salvage because they can be misleading. Recognition should be given to changes that may cause deviations from past trends, such as the kinds of materials to be removed in the future versus the kinds of materials that have been removed in the past, or changes in methods of removing plant from the way in which that plant was previously removed. Changes in company policy and environmental regulations can also affect the level of net salvage.

Most analysts are of the opinion that reasonable salvage and cost of removal estimates and forecasts can be made by trending experience and applying informed judgment. They believe it is difficult to justify the expense of detailed analyses. This would certainly hold true

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[2] Retirements, cost of removal and salvage associated with each specific work order or estimate are collected until the project is completed and closed. All amounts are then transferred to the Accumulated Depreciation account together.

in the case of relatively small companies and is probably true for most larger companies as well. In any case it would not be economically justifiable for any utility, regardless of size, to produce indepth salvage forecasts for all categories of plant.

Refining analyses of net salvage includes studies of the relationship between age and the percent of reuse salvage and forecasts of the future price of scrap salvage and labor. The reasons for making such analyses and the desirability of performing them are discussed below.

Because the likelihood of reuse is greater for items that are retired at early ages, the gross salvage realized for property retired at an early age is usually higher than the gross salvage that will be realized over the future life of the remaining property. Book salvage, therefore, may overstate the average salvage realized over the entire life of the property. Mathematical techniques have been developed to examine the relationship of age at retirement to reuse, but they are cumbersome to apply and the results they yield should be carefully interpreted to avoid incorrect conclusions. It is believed that the degree of additional precision that those techniques provide does not justify the necessary work involved and, consequently, they have not been included in this text.

The majority of present day utility plant will not be retired for many more years, and the sale of the retired plant will largely depend upon economic conditions existing at that time. It is, of course, impossible to make an accurate estimate of economic conditions expected to exist at some exact time in the distant future. However, because utility property generally retires gradually over a long period of time, it is necessary only to make reasonable estimates of average conditions expected in the future. For plant consisting of ferrous metals and wood, the junk value is quite low and even if future prices were double or half of what they were in the past, the future salvage percentage would not differ significantly from the past. For plant consisting mostly of nonferrous metals, junk salvage may be quite high. Even so, considering that the significant item is the average of future prices, it is unlikely that a large error will be made by deriving future percentages of junk salvage from past averages or from trends of past percentages. It is important to bear in mind also that the mix of items of plant retired in the past may be different from the mix of items of plant retired in the future, even within the same account or depreciation category. The realized junk salvage from past retirements, therefore, may not be representative of future salvage.

Graphing techniques used to analyze past scrap prices and project future scrap prices can be found in older depreciation texts, including the *1968 NARUC Manual*,[3] but the results may not justify the time and effort involved in making the analyses. Consequently, this type of analysis has fallen largely into disuse. For example, the FCC no longer requires the submission of junk metal weight studies in connection with the depreciation rate represcription process. These techniques have not been included in this text.

It is often stated that future costs of removal must logically be higher than past costs simply because labor costs are constantly on the increase. In general, this may be a true statement but it does not necessarily indicate that the percentage removal cost will increase.

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[3] NARUC Depreciation Subcommittee of the Committee on Engineering, Depreciation, and Valuation, *Public Utility Depreciation Practices* (Washington, D.C.: NARUC, 1968).

Although removal labor costs increase so do placement labor costs, and a higher removal cost related to a higher value of plant retired may result in essentially no change in the percentage cost of removal. Furthermore, if labor costs and/or the number of items to be removed are increasing, it becomes economical in many cases to invest in special tools which may actually result in an overall decrease in removal cost per item removed.

The factors that cause future costs of removal to differ from the past, that is, changes in labor costs and removal techniques, are difficult to predict with accuracy over the considerably long periods of time between the placement of plant and its retirement. Here again the time and effort involved in making detailed forecasts are usually not justified by the results. It is believed that an analyst, cognizant of the factors that may cause future cost of removal experience to differ from that of the past, is able to adequately estimate the future cost of removal as a percent of retirements. This is accomplished by applying informed judgment to modify the results of historical analyses.

Salvage for Life Span Categories

The life span categories consist generally of fairly long-life, structure-like plant, such as buildings, power plants, and telephone central office switching equipment. While each building or equipment installation might experience a number of modifications or additions subsequent to the date of its initial installation, each unit will retire in its entirety at the same time.

For buildings, the possibility of reuse will vary from building to building depending upon a variety of factors, including its age at final retirement, its size, the neighborhood in which it is located, and the possibility for reuse by the utility itself. For other life span categories, there may be some market outside the company for finally retired material, but frequently the reuse market is internal. When the particular model of equipment is current, reuse possibilities are high, but when it becomes obsolete, reuse may be negligible. The equipment at each installation should be considered from the standpoint of expected age at retirement and the possibility of reuse based on expected future company policy. Such future policy might be expected to have some semblance to past policy regarding the reuse of the same or similar type of equipment.

Net salvage associated with final retirements must be composited with interim net salvage resulting from expected piecemeal retirements in order to develop an estimate of future net salvage. Therefore, in order for the life span method to be applied properly, individual records of additions and retirements associated with each building and large installation must be maintained. Such records allow for data on interim and final retirements, gross salvage, and the cost of removal to be separately identified. This facilitates their analysis in the process of estimating future interim and final net salvage.

The breakdown between future interim and future final retirements can be determined by applying the interim retirement life table to surviving balances. Table 11-1 illustrates an approach in which the amount surviving at final retirement is determined by vintage. Life table values are used to factor down the amount surviving at the time of the study to reflect expected (interim) retirements for each vintage between the time of the study and the time of final retirement. The calculated interim and final retirement amounts can then be used to weight the estimated future interim and future final gross salvage, and the cost of removal percentages to estimate average net salvage for the life span category as follows:

		Gross Salvage		Cost of Removal	
	Amount	Percent	Amount	Percent	Amount
	(a)	(b)	(c)=(a*b)	(d)	(e)=(a*d)
Past Interim Retirements	$ 902	7.3	$ 66	41.9	$ 376
Future Interim Retirements	827	7.0	58	42.0	347
Future Final Retirements	13,332	25.0	3,333	4.0	533
Total or Average	$15,061	23.0	$ 3,457	8.3	$1,256

Average Net Salvage = 23.0% - 8.3% = 14.7% or rounded to 15%

TABLE 11-1

DETERMINATION OF FUTURE INTERIM RETIREMENTS AND FUTURE FINAL RETIREMENTS FOR A LIFE SPAN CATEGORY

(a) Year placed	(b) Age at 1/1/95	(c) Age at final retirement 2004 - (a)	(d) Gross additions	(e) Actual amount surviving at 1/1/95	(f) Theoretical proportion of gross additions surviving at 1/1/95[1]	(g) Theoretical proportion of gross additions surviving at final retirement[2]	(h) Amount of 1/1/95 plant surviving at final retirement (e)*(g/f)
1994	0.5	10	$1,372	$1,350	0.998	0.960	$1,299
1993	1.5	11	1,515	1,509	0.995	0.955	1,448
1992	2.5	12	956	952	0.992	0.950	912
1991	3.5	13	398	388	0.988	0.944	371
1990	4.5	14	451	442	0.985	0.938	421
1989	5.5	15	614	601	0.981	0.932	571
1988	6.5	16	826	789	0.976	0.926	749
1987	7.5	17	108	101	0.972	0.920	96
1986	8.5	18	785	676	0.967	0.913	638
1985	9.5	19	530	445	0.963	0.906	419
1984	10.5	20	184	169	0.958	0.899	159
1983	11.5	21	365	351	0.952	0.892	329
1982	12.5	22	181	149	0.947	0.884	139
1981	13.5	23	1,068	1,041	0.941	0.876	969
1980	14.5	24	2,999	2,855	0.935	0.868	2,650
1979	15.5	25	1,467	1,288	0.929	0.859	1,191
1978	16.5	26	1,242	1,053	0.923	0.851	971
Total			$15,061	$14,159			$13,332

[1] From Interim Retirement Life Table

[2] Interpolation of proportion surviving of age at final retirement (Column c) from Interim Retirement Life Table

Interim retirement life table

Age	Proportion surviving
0.0	1.000
0.5	0.998
1.5	0.995
2.5	0.992
3.5	0.988
4.5	0.985
5.5	0.981
6.5	0.976
7.5	0.972
8.5	0.967
9.5	0.963
10.5	0.958
11.5	0.952
12.5	0.947
13.5	0.941
14.5	0.935
15.5	0.929
16.5	0.923
17.5	0.917
18.5	0.909
19.5	0.903
20.5	0.895
21.5	0.889
22.5	0.879
23.5	0.873
24.5	0.863
25.5	0.855
26.5	0.847

Total and Future Net Salvage

Total or average net salvage is the weighted average of net salvage actually experienced in connection with past retirements and net salvage expected to be experienced in connection with future retirements. As a percent of retirements, this amount will sometimes be quite different from either past or future net salvage. Total or average net salvage must be used when the whole life technique is employed. When strictly forward looking procedures or techniques are used, i.e., the ELG procedure and the Remaining Life technique, only future net salvage should be used.

Gross salvage and cost of removal associated with past retirements of plant from surviving vintages will seldom be the total realized gross salvage and cost of removal from the company's books, since the accounting records may contain amounts associated with the complete retirement of old vintages. It is necessary, however, to rely on the book amounts and, having determined the amount of past retirements from existing vintages in connection with the service life study, it is customary to sum the annual book retirements, year by year, starting with the most recent year, until the past retirement amount has been reached. For this amount, the associated gross salvage and cost of removal are then summed up and are generally weighted directly with future gross salvage and cost of removal to arrive at average net salvage, as indicated in the following example:

	Retirement $ (a)	Gross Salvage % (b)	Salvage Weight $ (c)=(a*b)	Cost of Removal % (d)	Removal Weight $ (e)=(a*d)
Past	3,920	34.0	133,280	10.5	397,040
Future	28,360[1]	12.6	357,336	14.0	397,040
Total or Average	32,280	15.2[2]	490,616	13.6[3]	438,200

Average Net Salvage = 15.2% - 13.6% = 1.6% or rounded to 2%

[1] When using the generation arrangement as discussed in Chapter IX, the future dollars should equal the amount surviving.

[2] Total Column c/Total Column a

[3] Total Column e/Total Column a