For decades, accountants have relied on survivor curves to estimate utility plant service life. While useful for calculating depreciation on smaller plant assets, this method can be misleading. A more reliable method begins with smart utility planning and sound engineering judgment.
THE HISTORY OF SURVIVOR CURVES
The procedure many accountants and depreciation consultants typically use to forecast the remaining service life of utility assets relies on historical accounting additions and retirements that involve what are known as “Iowa Survivor Curves.”

In use for decades, survivor curves have played a critical role in utility rate cases involving disputed depreciation expenses, major write-offs and utility rate-setting. In many cases the financial stakes for ratepayers can be substantial, often in the millions of dollars.

Developed in the 1950s during a University of Iowa study using statistics and observed-life tables, survivor curves consist of 31 standardized patterns of asset retirements organized in four general categories. Each curve represents a probability distribution with certain attributes. The categories include:

- Original Modal (“O” Curve)
- Symmetrical (“S” Curve)
- Right-Modal Curve (“R” Curve)
- Left-Modal Curve (“L” Curve)

THE TRADITIONAL ROLE OF SURVIVOR CURVES
Depreciation rates for utility plants have historically been calculated using one of two methods: the Whole Life Method or the Life Span Method with Remaining Life Technique (Life Span Method).

The Whole Life Method is typically used for tools, vehicles, computers, furniture and other asset groups that meet one of three conditions:

1. There are relatively few units with no definite or planned final retirement date.
2. The retirement dates of individual units are independent of each other.
3. Additions to the group are generally independent of existing units.

With the Whole Life Method, the annual depreciation rate is calculated using the following formula, where NS is the asset group’s current net salvage percentage and ASL is its average service life.

\[
\frac{1 - NS}{ASL}
\]

Alternately, the Life Span Method calculates depreciation rates based on the assumption that all units in an asset group will retire concurrently at a single forecasted point in time or have similar average service lives, whether the units are part of the initial installation or added later. Buildings, boilers, turbines, conductors and other power production assets typically fall into this category.

The Life Span Method depreciation rate automatically adjusts for past under-accruals and over-accruals by using the reserve ratio (RR) to build those amounts into the interim depreciation rate calculation. RR is the depreciation reserve amount divided by the plant balance at the time of the study. Other variables in the depreciation calculation include the future net salvage rate (FS), that is, the future salvage value, less removal costs, expressed as a percentage of the total plant balance, as well as the remaining service life (RSL). The Life Span depreciation rate is expressed mathematically as:

\[
\frac{1 - FS - RR}{RSL}
\]

DEFINING TERMS
Depreciation is a reduction in the value of an asset over the passage of time, due to wear and tear from causes not restored by maintenance and or protected by insurance.

Depreciation expense is the method by which a company recovers an asset’s cost over the duration of its service life. Accountants record depreciation as an expense to spread its initial cost over its useful service life.
With either depreciation method, the most critical — and arguably most subjective — task is estimating the average and remaining service lives of utility assets. Utilities and regulatory agencies need reliable and accurate procedures for making these estimates.

**THE PROBLEM WITH SURVIVOR CURVES**

Even in a best-case scenario, a power plant’s historical addition and retirement accounting data is incomplete. Data is only available for a portion of an asset’s life because the asset is not yet retired. Further, this data is often limited for certain types of assets. For example, “Account 311: Structures & Improvements” might include buildings but have very few retirements to draw upon.

More importantly, assets are retired for a variety of reasons and the causes for smaller, interim retirements are not likely to be indicative of major future retirements. Interim retirements, for example, might be the result of malfunctioning or worn-out equipment. Often, major retirements are completed for technological, economic or other entirely unrelated reasons. Even political and social factors can impact asset retirement decision-making.

**PREDICTING THE SERVICE LIFE OF POWER GENERATION FACILITIES**

If operated properly and maintained in accordance with good utility practices, power generation facilities can provide reliable, long-term service for many years. Under normal conditions, most power generation facilities can be expected to be technically and mechanically capable of normal operations for 55 to 65 years.

The reality, however, is that a plant’s actual service life and remaining service life will not likely be determined by the plant’s mechanical capabilities. Rather, it will probably be determined by the economic practicality of its continued operation. In addition, spare parts can also be increasingly difficult to obtain as plants age.

Because survivor curves are not designed to address these conflicting realities, the results they produce can sometimes be misleading. For example, why would “Account 312: Boiler Plant Equipment” have a longer remaining service life than “Account 314: Turbogenerator Units” at the same plant, especially when the entire plant will be retired on the same date? Unfortunately, this is often the case when survivor curves are used. While it is unlikely that a utility CEO or board of directors will factor survivor curves and historical accounting data into a decision on when to retire a power generation facility, the question then becomes: Why do accountants and depreciation consultants rely so heavily on this information when estimating remaining service lives?

The choice of depreciation method matters because often — too often — generation facilities are retired before their costs are recovered, resulting in millions of dollars in stranded costs that must be recovered from ratepayers.

**THE SURVIVOR CURVE IN THE REAL WORLD**

Consider, for example, a depreciation study completed by a consultant for a major utility a few years ago. Relying on historical accounting data and the survivor curve methodology, the consultant estimated the remaining service lives of the generation accounts for several power plants. The depreciation analysis developed was standard for the utility industry.

The survivor curve analysis developed for one plant — and approved by the state commission and Rural Utilities Service — resulted in an estimated retirement date of 2034. This facility will actually be retired in 2019.

Another plant was estimated to retire in 2033, based on survivor curves and historical accounting data. That depreciation study was also approved by the state commission and the Rural Utilities Service. The plant was deactivated in 2014. A utility spokesperson explained to the press at the time that the facility had “experienced losses for several years” and could no longer be operated “in an economic manner.” Because of the inaccurate depreciation study results, the utility would have to write off approximately $100 million, setting aside that amount — approximately $850 per customer — for potential future recovery from ratepayers.

**A BETTER SOLUTION**

Because a power plant’s average and remaining service lives are unknown, they will always need to be estimated. From a practical standpoint, however, average and remaining service life decisions for major utility assets
should not primarily be determined using historical accounting data and survivor curves. Rather, they should be based on an analysis of many factors, including:

- Economic considerations
- Maintenance requirements of deteriorating equipment
- Utility staff technical input
- Utility planning
- Future environmental regulations
- Technological innovations
- Political and social factors
- Emerging efficient resources
- Declining performance

To obtain the most accurate estimates possible, utilities should conduct on-site engineering assessments of major utility assets while at the same time completing interviews with utility management and technical utility staff.

Performance results, capital budgets, inspection reports, technical documents — such as drawings and specifications — market analyses, capital work plans, operating statistics, staffing levels, major maintenance records and plans, and other documents should also be analyzed when developing remaining service life estimates, as should the historical accounting data. While beyond the scope of a typical depreciation study, an evaluation of market economics — plus asset-specific remaining life assessments — are the real drivers of each plant’s remaining service life. These studies will result in a robust resource plan that is defensible before state and other commissions; however, historical accounting data analyses should focus on the types of assets being added and retired, as well as their impact on capital planning.

The bottom line is that survivor curves and historical accounting data should not play a role in utility management’s decisions on deciding when major utility assets are retired. Utility management’s opinion, sound engineering judgment and technical utility staff knowledge must be relied upon to understand why and determine when major utility assets can be expected to be retired.

**BIOGRAPHY**

**JON SUMMERVILLE** is a project manager at Burns & McDonnell, specializing in depreciation studies, RFPs for power supply, economic studies, load forecasts and financial analyses. With more than 20 years of experience in the utility industry, Jon has served as a project leader for projects to analyze complex developments, long-term forecasts, valuations, power purchase agreements, rate cases, acquisitions, depreciation studies and useful life assessments.