Exhibit No.:
Issue: Depreciation
Witness: Donald S. Roff
Type of Exhibit: Direct Testimony
Sponsoring Party: Atmos Energy Corporation
Case No.: GR-2006-____
Date Testimony Prepared: April 4 , 2006

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. GR-2006-____

DIRECT TESTIMONY

OF

DONALD S. ROFF

ON BEHALF OF

ATMOS ENERGY CORPORATION

April 2006

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Atmos Energy Corporation's Tariff Revision Designed to Consolidate Rates and Implement a General Rate Increase for Natural Gas Service in the Missouri Service Area of the Company.	))))	Case No.

AFFIDAVIT OF DONALD S. ROFF

STATE OF TEXAS)
) ss
COUNTY OF DALLAS)

Donald S. Roff, being first duly sworn on his oath, states:

1. My name is Donald S. Roff. I work in Dallas, Texas, and I am employed by Depreciation Specialty Resources as its President.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Atmos Energy Corporation consisting of 12 pages and Exhibits DSR-1, DSR-2 and DSR-3, all of which having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

Donald S. Roff

Subscribed and sworn before me this 4th day of April 2006.

Notary Public

My commission expires: August 13, 2006

ETHEL Z TAYLOR
Notary Public
State of Texas
My Commission Expires
August 13, 2006

BEFORE THE

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO.

PREPARED DIRECT TESTIMONY

OF

DONALD S. ROFF

On Behalf of

ATMOS ENERGY CORPORATION

I. POSITION AND QUALIFICATIONS

Q. Please state your name, position and business address.

A. My name is Donald S. Roff. I am a President of Depreciation Specialty Resources ("DSR"). My business address is 2832 Gainesborough Drive, Dallas, Texas 75287-3483.

Q. Please describe your professional background and experience.

A. My professional background and experience is described more particularly in Schedule DSR-1 attached to my testimony.

Q. Have you ever testified before this Commission or any other regulatory body?

A. Yes. In, fact I recently provided testimony in Docket No. ER-2004-570 on behalf of the Empire District Electric Company. A complete list of the regulatory proceedings in which I have participated by providing testimony is set forth in Schedule DSR-2 attached to my testimony.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. I have conducted a depreciation study of depreciable gas properties in Missouri of Atmos Energy Corporation ("Atmos" or the "Company") as of September 30, 2005, and have made recommendations for revised depreciation rates, as necessary, for inclusion in the Company's revenue requirement. The purpose of my testimony is to present the study results, describe the depreciation study process and recommend appropriate depreciation rates for use by Atmos reflecting depreciation accounting principles and regulatory rules. I will show that my study produces a fair and reasonable level of depreciation expense utilizing sound accounting practices and principles.

Q. Are you sponsoring any exhibits in connection with the depreciation study you performed?

A. Yes. I am sponsoring Schedule DSR-3, which presents the depreciation study report prepared for the Company described above, and which includes a discussion of depreciation accounting principles, describes the depreciation study methodology, summarizes the study results and itemizes recommendations related to depreciation rates and depreciation accounting .

Q. Was Schedule DSR-3 prepared by you or under your direction and control?

A. Yes.

III. DEPRECIATION ANALYSIS

Q. What were your findings and recommendations made in connection with the depreciation analysis you performed for the Company?

A. I found that changes were needed to the mortality characteristics for every asset category resulting in revised depreciation rates. A summary comparison of the existing and recommended depreciation rates by functional category follows:

Function	Existing	Recommended
	%	%
Storage	4.98	1.20
Transmission	1.60	0.73
Distribution	3.46	2.76
General	6.74	7.62
Total Gas Plant	3.44	2.78

.

Q. Have you quantified the impact on annual depreciation due to your recommended changes?

A. Yes. The above summary was taken from Schedule 1 of Schedule DSR-3. Using September 30, 2005 depreciable balances, the effect of the recommended depreciation rates on annual depreciation expense is a decrease of approximately $591,000.

Q. What are the primary forces that are driving this change in annual depreciation expense?

A. The change in annual depreciation expense is affected by three separate factors: changes in average service life; changes in net salvage; and the effect of reserve position. Because the existing mortality characteristics are not known, only generalizations can be made regarding the effect of the current study parameters on the recommended depreciation rates. Based upon the magnitude and direction of the change in depreciation rates

and annual depreciation expense, my opinion is that average service lives have increased, producing lower annual depreciation expense. This decrease is offset by negative net salvage.

Q. What is depreciation?

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

> *Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage (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.*[1]

Q. What is the significance of this definition?

A. This definition of depreciation accounting forms the accounting framework under which my depreciation study was conducted. Several aspects of this definition are particularly significant. Salvage (net salvage) is to be recognized. The allocation of costs is over the useful life of the assets. Grouping of assets is permissible. Depreciation accounting is a process of cost allocation; it is not a valuation process. And the cost allocation must be both systematic and rational.

Q. Please explain the importance of the terms "systematic" and "rational"?

A. Systematic implies the use of a formula, and the formula used for calculating the recommended depreciation rates is shown on Page 7 of Schedule DSR-3. Rational means that the pattern of depreciation, in this case, the depreciation rate itself, must match either the pattern of revenues produced by the asset, or match the consumption of the asset. Since

[1] Accounting Research Bulletin No. 43, Chapter 9, Paragraph 5 (June 1953).

revenues are determined through regulation and are expected to continue to be so determined, asset consumption must be directly measured and reflected in depreciation rates. This measurement of asset consumption is accomplished by conducting a depreciation study.

Q. Are there other definitions of depreciation?

A. Yes. The Federal Energy Regulatory Commission (FERC) Uniform System of Accounts (USOA), followed by the Company, provides a series of definitions related to depreciation as shown on Page 5 of Schedule DSR-3. These definitions of depreciation make reference to asset consumption, and therefore relate very well to the accounting framework for depreciation. These definitions form the regulatory framework under which my depreciation study was conducted. I recommend remaining life rates that provide for full recovery of net investment adjusted for net salvage over the future useful life of each asset category, and are consistent with Atmos' past practice. It is my understanding that the Missouri Public Service Commission has adopted the FERC USOA.[2]

Q. Why is this citing significant?

A. This reference is significant because of the importance of General Instruction Number 11 of the USOA:

> "*Accounting to be on Accrual Basis,* A. The utility is required to keep its accounts on the accrual basis. This requires the inclusion in its accounts of all known transactions of appreciable amount which affect the accounts. If bills covering such transactions have not been received or rendered, the amounts shall be estimated and appropriate adjustments made when the bills are received. B. When payments are made in advance for items such as insurance, rent, taxes or interest the amount applicable to future periods shall be charged to account 165, Prepayments, and spread over the periods to which applicable

[2] 4 CSR 240-20.030, Rules of Department of Economic Development, Page 6.

by credits to account 165 and charges to the accounts appropriate for the expenditure."[3]

Thus the Company is required to maintain its books on an accrual basis. This requirement has particular significance to depreciation accounting and the inclusion of net salvage in the depreciation rate formula. Accrual accounting embodies the accounting principle of matching, which is the correlation between revenues and expenses. With respect to depreciation expense, we are concerned with the allocation of total cost over time

Q. Do you have any authoritative source which addresses this topic?

A. Yes. The following quotation directly addresses this topic:

> *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, as the name implies, is the difference between the gross salvage that will be obtained when the asset is disposed of and the cost of removing it. Positive net salvage occurs when gross salvage exceeds cost of removal, and negative net salvage occurs when cost of removal exceeds gross salvage. Thus the intent of the present concept is to allocate the net cost of an asset to annual 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 thought that ownership of property entails the responsibility for its ultimate abandonment or removal. Hence if current users of the property benefit from its use, they should pay their pro rata share of the costs involved in the abandonment or removal of the property.*
>
> *This treatment of salvage is in harmony with generally accepted accounting practices and tends to remove from the income statement fluctuations caused by erratic, although necessary, abandonment and uneconomical removal operations. It also has the advantage that current consumers pay a fair share, even though estimated, of costs associated with the property devoted to their service.*[4]

[3] 18 CFR Part 101.

[4] *Public Utility Depreciation Practices*, NARUC, 1968 Edition, page 24.

This quotation addresses several key accounting and ratemaking issues. First and foremost, net salvage is an appropriate component of depreciation. Second, inclusion of net salvage into depreciation results in a fair and equitable allocation of cost. Third, from a ratemaking perspective, inclusion of net salvage in depreciation expense fulfills the regulatory precept of having customers pay their fair share of costs of the life of the property devoted to their service. So such treatment is both good accounting and good ratemaking. The USOA instructions clearly intended cost of removal and salvage to be components of depreciation as they must be charged to Account 108, Accumulated Provision for Depreciation.[5]

Q. What is net salvage?

A. Net salvage is the difference between salvage and cost of removal. If cost of removal exceeds salvage, negative net salvage occurs.

Q. What are mortality characteristics?

A. Mortality characteristics are the parameters necessary to calculate depreciation rates. They include average service life, retirement dispersion defined by Iowa-type curves and net salvage factors.

Q. What are Iowa-type curves?

A. The Iowa-type curves were devised empirically over 60 years ago by the Engineering Research Institute at what is now Iowa State University to provide a set of standard definitions of retirement dispersion. Retirement dispersion merely recognizes that groups of

[5] 4 CSR 240-20.030, Paragraph 3(H). Charge original cost less net salvage to account 108., when implementing the provisions of Part 101 Electric Plant Instructions 10.F. and paragraph 15.060.10.F. The book cost less net salvage of depreciable electric plant retired shall be charged in its entirety to account108. Accumulated Provision for Depreciation of Electric Plant in Service (Account 110, Accumulated Provision for Depreciation and Amortization of Electric Utility Plant, in the case of Nonmajor utilities).

assets are comprised of individual assets having different lives, i.e., each asset retires at a differing age. Retirement dispersion is the scattering of retirements by age for the individual assets around the average service life for the entire group of assets. Standard dispersion patterns are useful and necessary because they make calculations of the remaining life of existing property possible and allow life characteristics to be compared.

The Engineering Research Institute collected retirement information on many types of industrial and utility property and devised empirical curves that matched the range of patterns found. A total of 18 curves were defined. There were six left-skewed, seven symmetrical and five right-skewed curves, varying from wide to narrow dispersion patterns. The Iowa-curve naming convention allows the analyst to relate easily to the patterns. The left-skewed curves are known as the "L series", the symmetrical as the "S series" and the right-skewed as the "R series." A number identifies the range of dispersion. A low number represents a wide pattern and a high number a narrow pattern. The combination of one letter and one number defines a unique dispersion pattern. There is also an "SQ" pattern that has no dispersion and is the equivalent of an amortization period, that is, all assets survive for their entire average life. This pattern has been used for certain General Plant accounts.

Q. Please describe the depreciation study process.

A. A depreciation study consists of four distinct yet inter-related phases: *data collection, analysis, evaluation and calculation*. Data collection refers to the gathering of historical investment activity and this information was provided by the Company. Analysis refers to the statistical processing of the data gathered in phase one. In my study there were two

separate analyses performed – one for the determination of life and one for the determination of net salvage. The analyses were conducted by me or under my supervision. Evaluation refers to the development of an understanding of asset history and its applicability to the surviving asset base into the future. This phase also gives consideration to changing asset base and Company plans and expectations. The evaluation phase was conducted by me with the assistance and input from Company personnel. The calculation phase utilizes the information and result determined in the first three phases in the computation of recommended depreciation rates, and was conducted by DSR personnel.

Q. Please discuss the life analysis procedure for storage, transmission, distribution and general plant.

A. For some asset categories, the age of both surviving and retired property is known, and actuarial analysis was utilized for these property groups. Actuarial analysis is described on Page 9 of Schedule DSR-3. For the remaining asset categories, the age of retirements is not known, and a simulation analysis technique was utilized. Simulation analysis is described on Page 10 of Schedule DSR-3.

Q. How were the Iowa curve shapes and average service life selections made?

A. Summaries of the individual asset category life analysis indications were prepared and discussed with Atmos personnel. Anomalies and trends were identified and engineering and operations input was requested where necessary. The types of assets surviving and retiring were discussed. A single average service life and Iowa curve was selected for each asset category reflecting the combination of the historical results and the additional

information obtained from the engineering, accounting and operations personnel. This process is a part of the Evaluation phase of the depreciation study.

Q. Please explain the salvage and cost of removal analysis.

A. Annual salvage amounts, cost of removal and retirements were provided by account for the period 1991 though 2005. Annual salvage, cost of removal, and net salvage percentages were calculated by dividing annual salvage, cost of removal and net salvage amounts by the retirement amounts.

Q. What are the results of your depreciation study for storage plant?

A. For the Storage Plant function, the composite depreciation rate decreases from 4.98% to 1.20%. I believe that a longer service life and the reserve position influence the depreciation rate decrease.

Q. What are the results of your depreciation study for transmission plant?

A. For the Transmission Plant function, the depreciation rate decreases from 1.60% to 0.73%. In my opinion, a portion of the decrease in depreciation rate is attributable to longer average service lives, and a portion is attributable to the reserve position, whereby the accumulated depreciation to date is higher than it would have been, presuming that assets retiring in the future follow the selected patterns. The net dollar impact of the change in depreciation rate is a decrease in annual depreciation expense of approximately $83,000.

Q. What are the results of your depreciation study for distribution plant?

A. For the Distribution Plant function, the depreciation rate decreases from 3.46% to 2.76%. Based upon my review of the existing depreciation rate, both average service lives and net salvage factors have changed. The impact on annual depreciation expense is an increase of approximately $515,000 due to the weighting of individual account amounts.

Q. What are the results of your depreciation study for general plant?

A. The composite depreciation rate increases from 6.74% to 7.62%. In general, average service lives have been shortened and the accumulated depreciation balance is greater than the theoretical reserve. The impact of the change in rate is an increase in annual depreciation expense of approximately $40,000.

Q. What are the results of your depreciation study for the total Company?

A. At the total Company depreciable level, the composite depreciation rate decreases from 3.44% to 2.78%, or approximately $591,000 less depreciation expense on an annual basis.

Q. Please summarize your recommendations.

A. I recommend that Atmos adopt the depreciation rates shown on Schedule 1 of Schedule DSR-3 and that this Commission approves their use. I base this recommendation on the fact that I have conducted a comprehensive depreciation study, giving appropriate recognition to historical experience, recent trends and Company expectations. My study results in a fair and reasonable level of depreciation expense which, when incorporated into a revenue stream, will provide the Company with adequate capital recovery until such time as a new depreciation study indicates a need for change.

Q. Does this conclude your testimony?

A. Yes.

DONALD S. ROFF

SIGNIFICANT CAREER EXPERIENCE

Depreciation Specialty Resources	**-**	**President**
Deloitte & Touche LLP	**-**	**Director**
Ernst & Whinney	**-**	**Supervisor, Advisory Services Utility Group**
Gilbert Associates, Inc.	**-**	**Senior Consulting Engineer**

RELEVANT EXPERIENCE AND QUALIFICATIONS

In November 2005 Mr. Roff left Deloitte to form Depreciation Specialty Resources ("DSR") to serve the utility industry. DSR advises utility companies on depreciation and property accounting matters, including SFAS No. 143 and FIN 47, both dealing with Asset Retirement Obligations.

Mr. Roff is a former Director of the Depreciation Group with the regulatory consulting group of Deloitte & Touche LLP and was a Firm-designated Public Utility Industry Specialist. He specializes in the areas of depreciation, decommissioning, valuation and fixed asset accounting systems. He has over thirty-three years experience with expertise in the areas of capital recovery economics, fixed asset accounting procedures, valuation, and financial analysis, having conducted over 200 depreciation and valuation studies for over 50 electric, gas water, steam heating utilities, telecommunications companies and railroads throughout the United States and several foreign countries. He is thoroughly familiar with capital recovery principles and procedures, as well as having a comprehensive understanding of utility organization, accounting, operations, information systems and regulatory practices as affects utilities. Mr. Roff has presented expert testimony on depreciation and fixed asset accounting practices before several regulatory bodies.

Mr. Roff has experience within the industry from the standpoint of accounting policy, capital recovery analysis, depreciation procedures, decommissioning, fixed asset systems and Financial Accounting Standards Board (FASB) accounting and regulatory requirements. Included in these studies were reviews of operations practices, maintenance policy, capitalization policy and property unit definition, accounting issues and treatment, rate base effect, impairment and financial integrity.

Prior to his association with Deloitte & Touche, he was employed by the Utility Group of Ernst & Whinney where he had responsibility for a variety of consulting assignments, including management audits, litigation support and depreciation. Two of these engagements were relative to the investigation of costs and management decision-making ability for two major nuclear facilities. This included an investigation and evaluation of the decisions made, their timing and cost impact, and the revenue and accounting implications of these costs.

At Gilbert he had progressively increasing responsibilities for depreciation and valuation assignments over a period of eleven years. His work included field inventories, unit pricing replacement cost analysis, property record review, property inspections, and detailed mortality analyses and net salvage evaluations.

Mr. Roff's valuation activities have included property tax evaluations, replacement cost studies for SEC reporting, tax depreciation, and fair market value analyses. He has directed several studies using standard appraisal techniques such as unit pricing and trending.

Mr. Roff has also been responsible for the preparation of an Independent Engineers' Certificate. Such an assignment requires a review of utility maintenance policy and practices and attestation of proper actions for the mortgage holder.

Mr. Roff's pertinent engagements include:

- **Oklahoma Natural Gas Company - Conducted a depreciation study and provided support through expert testimony before the Oklahoma Corporation Commission.**

- **The Empire District Electric Company - Conducted a depreciation study and provided support through expert direct, rebuttal and surrebuttal testimony before the Missouri Public Service Commission. This was an extensive litigation in which the treatment of net salvage for depreciation purposes was a significant issue.**

- **Los Angeles Department of Water and Power – Conducted depreciation studies of both energy services and water divisions and developed depreciation rate recommendations. Also aided in the establishment of net book value amounts.**

- **Sierra Pacific Power Company - Conducted a depreciation study and provided support through expert testimony before the Nevada Public Utilities Commission.**

- **Entergy New Orleans, Inc. - Provided expert testimony on various depreciation accounting and ratemaking issues before the City Council.**

- **Nevada Power Company – Conducted a depreciation study and provided support through expert testimony before the Nevada Public Utilities Commission.**

- **Atlanta Gas Light Company – Conducted a depreciation study and provided support through expert testimony before the Georgia Public Service Commission.**

- **Reliant Energy Arkla – Conducted depreciation studies for both Arkansas and Oklahoma jurisdictional properties and assisted with testimony, data responses and ultimate settlement positions.**

- **Savannah Electric and Power Company – Conducted a depreciation study and provided support through expert testimony before the Georgia Public Service Commission.**

- **Gulf Power Company – Conducted a depreciation study and provided support through deposition and expert testimony before the Florida Public Service Commission.**

- **Georgia Power Company – Assisted with the conduct of a depreciation study and support before the Georgia Public Service Commission.**

- **Reliant Energy Entex – Conducted a depreciation study and provided testimony before the City of Tyler, Texas.**

- **Entergy – Provided advice and testimony regarding appropriate depreciation practices and parameters related to Nuclear Production Plant, including the issues surrounding license renewal.**

- **Atmos Energy – Conducted a depreciation study and supported the results before the Texas Railroad Commission. Although a settlement agreement was reached, the Equal Life Group depreciation procedure was adopted by the Company and endorsed by the Commission.**

- **PacifiCorp (now owned by Scottish Power) – Assisted with evaluation of service lives and net salvage of assets and regulatory support of the results. Participated in regulatory proceedings before the Utah Department of Public Utilities, Oregon Public Utilities Commission, the Washington Utilities and Transportation Commission, and the Wyoming Public Service Commission, including direct testimony, preparation of responses to extensive data requests and settlement negotiations. That initial study has been updated through March 31, 2002, and filed in each of PacifiCorp's primary jurisdictions.**

- **Public Service Electric and Gas Company – Conducted a depreciation study of gas property and supported the results in regulatory proceedings before the New Jersey Board of Public Utilities. Also assisted with the establishment of capitalization policy for deregulated generation assets.**

- **Hawaii Electric Industries – Assisted with the development of depreciation rates and depreciation accounting policy issues for three Companies regulated by the State of Hawaii Public Service Commission.**

- **Avista (formerly The Washington Water Power Company) – Assisted with evaluation of service lives and net salvage of assets and regulatory support of the results. Participated in settlement discussions before the Idaho Public Service Commission Staff. Also was involved with regulatory negotiations with the State of Washington utility commission staff.**

- **The Detroit Edison Company – Assisted with evaluation of service lives of assets and regulatory support of the results. Participated in regulatory proceedings before the Michigan Public Service Commission, including direct testimony, preparation of responses to data requests, rebuttal testimony, cross-examination and development of briefs.**

- **Long Island Lighting Company – Assisted with an evaluation of retirement dates for Company generating facilities and development of capital recovery strategies and depreciation rates, including treatment of decommissioning costs.**

- **Duke Power Company - Assisted with an analysis and evaluation of competitive position and development of capital recovery strategies.**

- **Virginia Power - Conducted a review and evaluation of the Company's depreciation study filing, including the development of appropriate capital recovery strategies.**

- **Lone Star Pipeline Company - Conducted depreciation study of all gas property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, and preparation of responses to detailed data requests before the Texas Railroad Commission.**

- **Entergy Gulf States, Inc. - Conducted depreciation study of all electric property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, before the Public Utility Commission of Texas.**

- **Entergy Gulf States, Inc. - Conducted depreciation study of all electric property, including life analysis, salvage and cost of removal analysis,**

evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, before the Louisiana Public Service Commission.

- **Central Power and Light Company - Conducted depreciation study of all electric property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, and cross-examination before the Public Utility Commission of Texas and preparation of rebuttal testimony.**

- **West Texas Utilities Company - Conducted depreciation study of all electric property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, cross examination before the Public Utility Commission of Texas and preparation of rebuttal testimony.**

- **Consumers Power Company - Conducted depreciation study of all electric, gas and common property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, cross examination before the Michigan Public Service Commission and preparation of rebuttal testimony; Included testimony on fixed asset accounting practices and specific depreciation accounting issues.**

- **Indianapolis Power & Light Company - Conducted depreciation study of all electric property, including life analysis, salvage and cost of removal analysis, evaluation of history, presented testimony, exhibits, preparation of responses to detailed data requests, cross examination before the Indiana Utility Regulatory Commission and preparation of rebuttal testimony; Included testimony on fixed asset accounting practices and specific depreciation accounting issues.**

- **Northwest Natural Gas Company - Conducted depreciation study of all gas property, including life analysis, salvage and cost of removal analysis, evaluation of history, discussions of fixed asset accounting issues and preparation of a formal report; Also included informal meetings with the Oregon and Washington Commission staffs. The benefit derived includes a standardization of depreciation rates by jurisdiction.**

- **Missouri Public Service - Conducted depreciation study of all electric, gas and common property, including life analysis, salvage and cost of removal analysis, evaluation of history, preparation of testimony and exhibits, responses to data requests and cross examination before the Missouri Public Service Commission.**

- **Atmos Energy Corporation - Conducted several depreciation studies for this multi-jurisdictional gas utility, including creation of asset histories,**

life analysis, salvage and cost of removal analysis, evaluation of history, and assisted with responses to data requests and strategies and positions of Atmos management, including regulatory filings in Kansas, Virginia and Louisiana.

- **Pennsylvania Power & Light Company - Developed a depreciation accounting issues workshop and presentation before Company management, including depreciation accounting issues, effects of competition and strategies for operating effectively in the future. Also included a critique of the Company's current depreciation study effort.**

- **Puerto Rico Electric Power Authority - Review the capitalization policy and property unit definitions for this electric utility operation. Included were significant discussions with operations personnel and plant visits to understand the existing operational and accounting framework, and the development of new procedures and the conduct of several training courses to operations and financial personnel.**

- **Palo Verde Nuclear Power Station - Served on the project team as project manager for a four Commission panel to investigate the prudence of asset expenditures at a multiple unit nuclear generating station. Tasks included selection of qualified bidders to investigate specific areas of construction practices.**

- **Empresa de Energia Electrica de Bogota - Served as on-site project director for complete inventory, original cost asset creation, and replacement cost calculation/valuation for World Bank financing. Supervised staff of twenty and had responsibility for all phases of analysis and fieldwork, including the development of a manual describing procedures for use with ongoing valuations.**

- **Nevada Power Company - Served as Project Director in assisting NPC in developing retirement unit definitions for new combined cycle units. Also aided in establishing a process for unitizing these assets during construction, including training of operations and accounting personnel.**

EDUCATIONAL BACKGROUND

B.S. - Rensselaer Polytechnic Institute, Management Engineering

PROFESSIONAL ACTIVITIES

Mr. Roff is a Registered Professional Engineer in Pennsylvania (by examination). He is an Associate Member of the American Gas Association (A.G.A.). He is the lead instructor for the A.G.A. "Principles of Depreciation Seminar", and has published several articles, and presented numerous speeches on the subjects of

capital recovery and depreciation accounting. He is a member of the Society of Depreciation Professionals and a Certified Depreciation Professional.

Depreciation Specialty Resources

Atmos Energy Corporation

Book Depreciation Study of
Atmos Energy Corporation
Missouri Properties
As of September 30, 2005

2832 Edgewood Drive Dallas TX 75228-3483 469-964-9090

Atmos Energy Corporation

Book Depreciation Study of
Atmos Energy Corporation
Missouri Properties
As of September 30, 2005

March 2006

Atmos Energy Corporation
Three Lincoln Center
5430 LBJ Freeway
Dallas, TX 75240

Attention: Mr. Thomas Petersen

In accordance with your request and with the cooperation and participation of your staff, a book depreciation study of Atmos Energy Corporation's Missouri properties ("Atmos" or "the Company") has been conducted. The study covered all depreciable and amortizable property and recognized addition and retirement experience through September 30, 2005. The purpose of the study was to determine if the existing depreciation rates remain appropriate for the property and, if not, to recommend changes. Changes were found to be needed and are recommended. The changes in aggregate cause a decrease in depreciation rates used to calculate the annual depreciation expense.

A comparison of the effect of the existing rates and the recommended rates is shown below, based on depreciable plant balances as of September 30, 2005:

Function	Composite Depreciation Rate	
	Existing	Recommended
Storage	4.98	1.20
Transmission	1.60	0.73
Distribution	3.46	2.76
General	6.74	7.62
Total	3.44	2.78

The summary above is taken from Schedule 1, which shows the annual depreciation amounts calculated from the existing rates and the recommended account rates and the

differences. Based upon the September 30, 2005 depreciable balances, the recommended depreciation rates will result in an annual decrease in depreciation provisions of $591,208 or 19.4%. The study results are being driven by a decrease in depreciation rates for every functional asset category, except General Plant.

Schedule 2 shows the mortality characteristics used to calculate the recommended depreciation rates. The existing mortality characteristics are not known. The recommended depreciation rates are straight-line over life measured by time using the average life group (ALG) procedure and the remaining life technique.

The following sections of this report describe the methods of analysis used and the bases for the conclusions reached. The remainder of the report will present the results and recommendations for both immediate and future actions by the Company.

We appreciate this opportunity to serve Atmos Energy Corporation and would be pleased to meet with you to discuss further the matters presented in this report, if you desire.

Yours truly,

PURPOSE OF DEPRECIATION

Book depreciation accounting is the process of recognizing in financial statements the consumption of physical assets in the process of providing a service or a product. Generally accepted accounting principles require the recording of depreciation to be systematic and rational. To be systematic and rational, depreciation should, to the extent possible, match either the consumption of the facilities or the revenues generated by the facilities. Accounting theory requires the matching of expenses with either consumption or revenues to ensure that financial statements reflect the results of operations and changes in financial position as accurately as possible. The matching principle is often referred to as the "cause and effect" principle; thus, both the cause and the effect are required to be recognized for financial accounting purposes. This study was conducted in a manner consistent with the matching principle of accounting.

Because utility revenues are determined through regulation, and this study assumes that such regulation will continue, asset consumption is not automatically in revenues. Therefore, the consumption of utility assets must be measured directly by conducting a book depreciation study to accurately determine the mortality characteristics of the assets.

Matching is also an essential element of basic regulatory philosophy, and it has become known as "intergenerational customer equity". Intergenerational customer equity means the 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 the charges to customers reflect the actual costs of providing service.

DEPRECIATION DEFINTIONS

The Uniform System of Accounts ("USOA") prescribed for gas utilities by the Federal Energy Regulatory Commission ("FERC") followed by Atmos states that:

> "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 electric 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.
>
> "Net salvage value" means the salvage value of property retired less the cost of removal.
>
> "Salvage value" means the amount received for the 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 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.

As is clear from the wording of the salvage value and the cost of removal definitions, it is the salvage that will actually be received and the cost of removal that will actually be incurred, both measured at the price level at the time of receipt or incurrence that is required to be recognized in the depreciation rates of Atmos.

These definitions are consistent with the purpose of depreciation, and the study reported here was conducted in a manner consistent with both.

ACCOMPLISHMENT OF ACCOUNTING AND REGULATORY PRINCIPLES

Utility depreciation accounting is a group concept. Inherent in this concept is the assumption that all property is fully depreciated at the time of retirement, regardless of age, and there is no attempt to record the depreciation applicable to individual components of the groups. The depreciation rates are based on the recognition that each depreciable property group has an average service life. However, very little of the property group is "average". The group carries with it recognition that most property will be retired at an age less than or greater than the average service life. This study recognized the existence of this variation through the identification of Iowa-type retirement dispersions.

The study required to determine the applicable mortality characteristics is independent from the calculation of depreciation rates. The resulting mortality characteristics can be used to calculate either Average Life Group ("ALG") or Equal Life Group ("ELG") rates, both with either the whole life technique or the remaining life technique. Any set of mortality characteristics that is suitable for calculating ALG rates is just as suitable for calculating ELG rates. Conversely, any set that is not suitable for ELG is not suitable for ALG. ALG and ELG are straight-line over life measured by time, with ALG utilizing average life and ELG utilizing actual life. For ALG, all property in the group is assumed to have a life equal to the average life. ELG recognizes that, in reality, only a small

portion of the group retires at an age equal to the average service life. For the average to exist, about half the investment in an asset group will be retired at ages less than average life, a small amount at average life, and the rest at ages greater than average life. It is the use of this dispersion in the rate calculation that causes ELG rates to better match cost recovery with the use and benefit of the property. Thus, the ELG procedure best accomplishes the purpose of book depreciation accounting by ensuring the recording of depreciation provision match the actual consumption of physical assets. Since ELG matches the recording of consumption with actual consumption, customers will pay the actual cost incurred to serve them. We encourage Atmos management to consider the ELG procedure in its Missouri depreciation policy. However, the recommendation for this study is to continue with the use of the existing, approved ALG methodology, which further provides consistency with the basis for the existing depreciation rates. A detailed discussion of the ELG procedure is included in the Appendix A to this report.

THE BOOK DEPRECIATION STUDY

Implementation of a policy toward book depreciation that recognizes the purpose of depreciation accounting requires the determination of the mortality characteristics that are applicable to the surviving property. One purpose of the depreciation study reported here was to accurately measure those mortality characteristics and to use those characteristics to determine appropriate rates for the accrual of depreciation expenses.

The major effort of the study was the determination of the appropriate mortality characteristics. The remainder of this report describes how those characteristics were

determined, describes how the mortality characteristics were used to calculate the recommended depreciation rates, and presents the results of the rate calculations.

The typical study consists of the following steps:

Step One is a Life Analysis consisting of the determination of historical experience and an evaluation of the applicability of that experience to surviving property.

Step Two is a Salvage and Cost of Removal Analysis consisting of a study of salvage and cost of removal experience and an evaluation of the applicability of that experience to surviving property.

Step Three consists of the determination of average service lives, retirement dispersion patterns identified by Iowa-type curves and the net salvage factors applicable to the surviving property.

Step Four is the determination of the depreciation rate applicable to each depreciable property group recognizing the results of the work in Steps One through Three, and a comparison with the existing depreciation rates.

LIFE ANALYSIS

The Life Analysis for the property concerns the determination of average service lives ("ASL") and Iowa-type dispersion patterns. An evaluation of investment experience suitably tempered by informed judgment as to the future applicability to surviving property formed the basis for the determination of average service lives and retirement dispersions.

An analysis of historical retirement activity, suitably tempered by informed judgment as to the future applicability of such activity to surviving plant, formed the basis for the determination of average service lives and retirement dispersion patterns for all property groups. For most accounts, retirement experience from transaction years 1970 through

2005 was analyzed using the Actuarial Method of Life Analysis. This method could be used because aged data are available.

The actuarial method determines actual survivor curves (observed life tables) for selected periods of actual retirement experience. In order to recognize trends in life characteristics and to ensure that the valuable information in the curves is available to the analyst, observed life tables were calculated and plotted by computer, using several different periods of retirement experience. The average service lives and retirement dispersion patterns indicated by the actual survivor curves were identified by visually fitting Iowa-type dispersion curves to the actual curves. Retirement dispersion refers to the pattern of retirements as a function of age over the life of each property group. For each asset category, an Iowa-type curve combined with an estimated average service life was selected. This selection was based upon an analysis of historical investment activity, associated mortality trends and the types of assets surviving and retiring. The workpapers prepared as an integral part of the depreciation study contain the rationale for each selection.

Trends in historical mortality experience are helpful in understanding history. In order to determine trends, the periods (year bands) of retirement experience analyzed were the past five years, the past ten years, the past fifteen years, the past twenty years and the full band of band of retirement experience. The observed life tables and the Iowa curves fitted to each of these year bands were plotted. This visual approach ensures that the data

contained in the observed life tables are available to the analyst and that the analyst does not allow the computer calculations to be the sole determinant of study results.

Where the age of retirement was not known, the Simulated Plant Record ("SPR") Method of life analysis was utilized. The SPR method determines retirement dispersion and average service life combinations for various bands of years which best match the actual retirements and balances for each asset category. The simulated balances procedure consists of applying survivor ratios (portion surviving at each age) from Iowa-type dispersion patterns in order to calculate annual balances, and then comparing the calculated balances with the actual balances for several periods, followed by statistical comparisons of differences in balances. The simulated retirements procedure is similar, except that the retirement frequency rates of the Iowa patterns are utilized to calculate annual retirements, and the comparisons are to actual retirements rather than to balances. Tabulations of the best ranking curves were made and this became the starting point for the evaluation phase of my review. In most cases, retirement history for a forty-year period was available.

For accounts having little experience or having retirement experience that is not an adequate measure of the expected mortality characteristics of surviving property, evaluation of the significance of history played a major role in selecting the mortality characteristics shown on Schedule 2.

SALVAGE AND COST OF REMOVAL ANALYSIS

Salvage and cost of removal experience was analyzed using experience from the period 1991 – 2005. Rolling and shrinking bands were analyzed to help expose trends. An evaluation of salvage and cost of removal experience suitably tempered by informed judgment as to the future applicability to surviving property formed the basis for the determination of salvage and cost of removal factors.

The analysis consisted of calculating salvage and cost of removal factors by relating the recorded salvage and cost of removal for each property group to the retirements that caused the salvage and cost of removal to occur.

EVALUATION OF ACTUAL EXPERIENCE

The typical evaluation consists of Life Analysis and Salvage and Cost of Removal Analysis, which involve the measurement of what has occurred in the past. History is sometimes a misleading indicator of the future. There are many kinds of events that can cause history to be misleading, among them significant changes contemplated in the underlying accounting procedures and/or changes in other management practices, such as maintenance procedures. It is the evaluation phase of a depreciation study that identifies if history is a good indicator of the future. Blind acceptance of history often results in selecting mortality characteristics to use for calculating depreciation rates that will provide recovery over a time period longer than productive life.

For each property group, the typical analysis processes involve only historical investment experience. Since depreciation rates will be applied to surviving property, the historical mortality experience indicated by a Life Analysis and the Salvage and Cost of Removal Analysis is evaluated to ensure that the mortality characteristics used to calculate the depreciation rates are applicable to the surviving property. The evaluation is required to ensure the validity of the depreciation rates.

The normal evaluation process requires knowledge of the type of property surviving; the type of property retired; the reasons for changing life, dispersion, salvage and cost of removal; and the effect of present and future Atmos plans on the property mortality characteristics.

CALCULATION OF DEPRECIATION RATES

A straight-line remaining life rate for each depreciable property group was calculated using the following formula:

$$\text{Rate} = \frac{\text{Plant Balance} - \text{Future Net Salvage} - \text{Book Reserve}}{\text{Average Remaining Life}}$$

Formula numerator elements in percent of depreciable plant balance and the denominator in years produce a rate in percent. This formula illustrates that a remaining life rate recognizes the book reserve position. The depreciable balances and book reserves were taken from accounting records, and the net salvage factors were determined by the study.

The remaining lives for each property group are a function of the age distribution of surviving plant and the selected average service life and retirement dispersion.

RESULTS

We do not know the exact mortality characteristics that support the existing rates, so the comments below provide a limited scope of what the reasons for the change in annual depreciation rates are. A comparison of the existing depreciation rates to the proposed study depreciation rates can be found on Schedule 1 in this report. A listing, by account, of the proposed mortality characteristics can be found on Schedule 2 in this report.

Storage Plant

The depreciation rate for this functional category decreases from 4.98% to 1.20%. The life is longer and the recognition of terminal salvage further reduces the depreciation rate. The decrease in annual depreciation expense is $33,160.

Transmission Plant

The depreciation rate for this functional category decreased from 1.60% to 0.73%. Longer lives were offset by negative net salvage. The major investment in this functional category is Account 367, Mains. An average service life of 70 years was selected with an R1 Iowa curve. Net salvage is estimated to be negative 5%. The decrease in annual depreciation expense is $82,726.

Distribution Plant

For this asset grouping, a decrease in the depreciation rate is indicated from 3.46% to 2.76%. Longer lives were offset by negative net salvage. Two accounts comprise the majority of the change in annual depreciation expense, Account 376, Mains and Account 380, Services. An average service life of 60 years with an R1.5 dispersion, was selected for Account 376. The net salvage allowance is negative 10%. For Account 380, the average service life is 33 years with an R5 curve. Net salvage is negative 35%. The decrease in annual depreciation is $514,831.

General Plant

There is a increase in depreciation rate indicated for this asset category from 6.74% to 7.62%. The primary driver is reserve position. The single largest change in annual depreciation is for Account 392, Transportation Equipment. The recommended average service life is 8 years with an L2 curve. Net salvage is estimated to be positive 10%. The annual depreciation expense increase is $39,509.

RESERVE COMPARISON

Because remaining life rates are recommended (consistent with the existing rates), a comparison of the accumulated provision for depreciation with the calculated theoretical reserve at September 30, 2005, is not meaningful, and no comparison is presented. This is because the only way a reserve difference can exist is through the use of whole life rates.

RECOMMENDATIONS

Our recommendations for your future action in regard to book depreciation are as follows:

1. The depreciation rates shown in Column 6 of Schedule 1 are applicable to existing property and are recommended for implementation at such time as their effect can be incorporated into service rates.

2. Because of variation of life and net salvage experience with time, a depreciation study should be made during 2010 based upon retirement experience through September 30, 2009. Exact timing of the study should be coordinated with a retail rate case to ensure timely implementation of revised depreciation rates.

3. We recommend that Atmos management give consideration to the use of the Equal Life Group ("ELG") depreciation procedure utilized in other jurisdictions. As described more fully in the Appendix, the ELG procedure provides a better matching of the recording of depreciation with asset consumption.

4. We recommend that Atmos consider the utilization of a vintage amortization accounting process. This approach has been implemented by numerous utilities all over the country. This approach solves the universal problem of unreported retirements, is intended to simplify the property accounting effort, and provides a better matching of the accounting effort with the magnitude of the asset base.

5. For new asset categories that arise in the future for which no depreciation rate is currently approved, we recommend that the functional composite depreciation rates be used until future depreciation studies are conducted. The functional composite are as follows:

Storage Plant	1.20%
Transmission Plant	0.73%
Distribution Plant	2.76%
General Plant	7.62%

CALCULATION OF EQUAL LIFE GROUP DEPRECIATION RATES

It is the group concept of depreciation that leads to the existence of the ELG procedure for calculating depreciation rates. This concept has been an integral part of utility depreciation accounting practices for many years. Under the group concept, there is no attempt to keep track of the depreciation applicable to individual items of property. This is not surprising, in view of the millions of items making up a utility system. Any item retired is assumed to be fully depreciated, no matter when the retirements occur. The group of property would have some average life. "Average" is the result of an arithmetic calculation, and there is no assurance that any of the property in the group is "average."

The term "average service life" used in the context of book depreciation is well known, and its use in the measurement of the mortality characteristics of property carries with it the concept of retirement dispersion. If every item was average, thereby having exactly the same life, there would be no dispersion. The concept of retirement dispersion recognizes that some items in a group live to an age less than average service life, and other items live longer than the average. Retirement dispersion is often identified by standard patterns.

The Iowa type dispersion patterns that are widely used by electric and gas utilities were devised empirically about 60 years ago to provide a set of standard definitions of retirement dispersion patterns. Figure 1 shows the dispersion patterns for three of these curves. The L series indicates the mode is to the Left of average service life, the R series to the Right, and the S series at average service life, and therefore, Symmetrical. There is also an O series which has the mode at the Origin, thereby identifying a retirement pattern that has the maximum percentage of original installations retired during the year of placement.

The subscripts on Figure 1 indicate the range of dispersion, with the high number (4) indicating a narrow dispersion, and the low number (1) indicating a wide dispersion pattern. For example, the R1 curve shown on the Figure indicates retirements start immediately and some of the property will last twice as long as the average service life. The dispersion patterns translate to survivor curves, which are the most widely recognized form of the Iowa curves. Other families of patterns exist, but are not as widely used as the Iowa type.

The methods of calculating depreciation rates are categorized as straight-line and non-straight-line. Non-straight-line methods can be accelerated or deferred. There are three basic procedures for calculating straight-line book depreciation rates:

Units-of-Production
Average Life Group (ALG)
Equal Life Group (ELG)

Each of these procedures can be calculated using either the whole life or the remaining life technique.

Productive life may be identified by (a) a life span or (b) a pattern of production or usage. Units-of-Production is straight-line over production or usage, while the others are straight-line over life measured by time. ALG is straight-line over the average life of the group, while ELG is straight-line over the actual life of the group.

The formulas for the whole life and remaining life techniques are shown on Table 1. For the ELG calculation procedure, Formulas 1 and 3 are applied to the individual equal life components of the property group. For the ALG calculation, the formulas are applied to the property group itself. Formula 2 is applied to the property group for either ELG or ALG. Use of the units (percent and years) in the formulas results in rates as a percent of the depreciable plant balance.

The depreciable plant balance is the surviving balance at the time the rate is calculated, and is expressed as a percentage (always 100) of itself. Salvage and reserves are expressed as a percent of the depreciable plant balance. For example, a property group having a 35 year average service life and negative 5% salvage would have an ALG whole life rate of (100 + 5)/35, or 3.00%.

The first term in Formula 2 is identical to Formula 1 for the whole life rate. The second term of Formula 2 illustrates that the difference between a remaining life rate and whole life rate is the allocation of the difference between the book and calculated theoretical reserves over the remaining life by a remaining life rate.

The widely used ALG procedure of depreciation rate calculation does not recognize the existence of retirement dispersion in the calculation. The difference between the ALG and ELG procedure is the recognition of retirement dispersion in the ELG rate calculation. ELG is a rate calculation procedure: nothing more. The data required to make the ELG calculation are average service life, retirement dispersion, net salvage and the age distribution of the property. The depreciation study required to determine the applicable mortality characteristics is independent from the calculation of the depreciation rates. The resulting mortality characteristics can be used to calculate either ALG or ELG rates, both with either the whole life technique or the remaining life technique. Any set of mortality characteristics that is suitable for calculating ALG rates is just as suitable for calculating ELG rates. Conversely, any set that is not suitable for ELG is not suitable for ALG either. The ELG procedure calculates the depreciation rates based on the expected life of each equal life component of the property rather than the average of all components. As discussed earlier, “average” is the result of a calculation and there may not be any ”average” property. When curves are used to define retirement dispersion, the average service life and the retirement dispersion pattern define the equal life groups and the expected life applicable to each group.

When retirement dispersion does not exist, the ELG rate is identical to the ALG rate. When dispersion exists, the ELG rate for recently installed property is higher than the ALG rate and for old property is lower.

A Simple Illustration of ELG

This illustration provides a framework for visualizing the ELG methodology. Table 2 assumes 20% of the $5,000 investment is retired at the end of each year following placement. The retirement frequencies are shown on Line 7. As shown in Columns 2 through 6, this means $1,000 of investment is retired each year, with the retirement at Age 1 being recovered in its entirety during Year One; at Age 2 in Years One and Two, etc. The depreciation rate applicable to each equal life group is shown on Line 8. The annual provision in dollars for Year One shown in Column 7 is made up of the Age 1 annual amounts shown on Line 1, Columns 2 through 6. As shown on the Table, the annual provision for Age 2 is equal to the annual provision for Age 1 less the amount collected during Year One applicable to the group retired during Year One. Thus, the annual provisions can be thought of as a matrix, with the provision for any given year being produced by a portion of the matrix.

The depreciation rates shown in Column 9 are determined by dividing the annual provisions in Column 7 by the survivors in Column 8. The rate formula shown on Table 2 can also be used to calculate the rates and is used on the Table to illustrate the working of the matrix by calculating the depreciation rates for Year One and Year Three. For Year One, the numerator and denominator both consist of five terms. Each year, the left-hand term of both numerator and denominator drop off. It should be noted that the reverse summation of retirement ratios (starting with Column 6 and moving left on Line 7) is equal to the survivor ratio at the beginning of the period shown in Column 10.

The formula can illustrate how the matrix can be thought of in terms of a depreciation rate. If the multiplier of 100 is incorporated in each element of the numerator of the formula, such as (100 x 0.2)/2, it can be seen that 100/2 is a rate and the retirement frequency (0.2) is a weighting factor. This particular rate (50%) is the one shown for Age 2 property on Line 8, Column 3.

It can be seen that the only data required for the ELG rate calculation are the retirement frequencies for each year. These frequencies are defined by the average service life and the shape of the dispersion pattern.

A Real Illustration of ELG

The depreciation analyst deals with much larger groups of property than appearing on Table 2. Table 3 contains an ELG rate calculation for an actual depreciable property group. The retirement frequencies shown in Column 4 are defined by the 38 year average service life and the L5 Iowa type dispersion pattern. The ALG rate without salvage for this property is 2.632% (100%/38 years), while the ELG rate varies from 2.704% at age 0.5 years to 1.471% at the age just prior to the last retirement, 67.5 years.

The rate listed in Column 5 at each age is the weighted summation of individual rates applicable to that portion of the surviving property that the retirement frequencies in Column 4 indicate will be retired in each following year. The combination of average service life and dispersion pattern means that the first retirement will be from the age 18.5 property during the following year at an age of 19 years; therefore, it will require a rate of 5.263% (1005/19 years). (This example does not have any surviving balance at age 18.5). The last retirement will be from age 67.5 year property; consequently, it will require a rate of 1.471% (100%/68 years). The vintage composite rate shown in Column 5 at age 0.5 years is the weighted summation of rates varying from 5.263% to 1.471%.

Since this example is for a narrow dispersion pattern, the first retirement occurs at age 19 years and the vintage composite rate remains 2.704% at age 19.5 years, because the first retirement drops the 5.263% rate from the summation.

A wider dispersion would result in a wider range of vintage composite rates than defined by the L5 curve (i.e., 2.704% to 1.471%).

All that is necessary for calculating the depreciation rates applicable to each age of property are the retirement frequencies. These frequencies are defined by the average service life and the retirement dispersion pattern. The determination of average service life requires the determination of the dispersion, as without dispersion there would be no “average”.

Depending on the dispersion pattern, the number of retirement frequencies making up the complete curve can be up to about 4.4 times the number of years of average service life. Thus, for an account whose number of retirement frequencies is three times average service life and whose average service life is 30 years, the rate applicable to the Age 1 property will be made up of the weighted summation of 89 components, etc. Thus, the rate calculation process is complex, but certainly not complicated. It is this complexity that makes the rate calculations much more practical using a computer.

DEPRECIATION RATE CALCULATION PROCEDURES

TABLE 1

Whole Life

$$\text{Rate (\%)} = \frac{PB - S}{ASL} \qquad \text{Formula 1}$$

Remaining Life

$$\text{Rate (\%)} = \frac{PB - FS}{ASL} \_ \frac{BR - CT}{ARL} \qquad \text{Formula 2}$$

$$\text{Rate (\%)} = \frac{PB - FS - BR}{ARL} \qquad \text{Formula 3}$$

Where

PB is Depreciable Balance, %
AS is Average Net Salvage, %
FS is Future Net Salvage, %
ASL is Average Service Life, years
BR is Depreciation Reserve, %
CTR is Calculated Theoretical Reserve, %
ARL is Average Remaining Life, years