A STUDY PERFORMED FOR
THE CALIFORNIA AIR RESOURCES BOARD

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ACCOUNTING, TAX AND FINANCING ISSUES RELATED TO AIR POLLUTION CONTROL INVESTMENTS

AO-136-32

JULY 1, 1983

Price Waterhouse

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ACKNOWLEDGEMENTS AND DISCLAIMER

This report was submitted in fulfillment of ARB contract number AO-136-32 to perform a "Review and Analysis of Special Accounting Practices, Tax Laws, and Other Financial Considerations Applicable to Selected California Industries." This report was developed by Price Waterhouse under the sponsorship of the California Air Resources Board. The preparation of the material presented in this report was completed in late July, 1982 and was updated in certain aspects through December 31, 1982. At the request of the Air Resources Board staff, an addendum to Chapter II was prepared discussing relevant aspects of the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA), which was adopted after the draft report was completed.

Experts Consulted

In addition to the specific reference citations following each chapter, several experts were consulted during the course of this study. The most significant of these included:

- Price Waterhouse Industry Specialists:
  - Public Utilities Industry Specialty Group
  - Chemical Industry Specialty Group
  - Petroleum Industry Specialty Group
- Energy Resource Consultants:

- Craig Miller, Ph.D.
- Michael D. Yokell, Ph.D.

- California Public Utilities Commission staff
- California Air Resources Board staff
  - John Holmes, Research Division Chief
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The statements and conclusions in this report are those of Price Waterhouse and not necessarily those of the California Air Resources Board. The mention of products, their sources, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

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EXECUTIVE SUMMARY

Background

The purpose of this report is to serve as a comprehensive summary of the financial accounting, tax accounting and other financial issues to be considered in developing analyses of the financial impact of required corporate investments in pollution abatement equipment.

The California Air Resources Board (ARB) is charged with the task of reducing industrial, commercial, and individual pollution in order to attain air quality goals adopted by the state and national governments. A significant factor to be considered in evaluating alternative paths towards these air quality goals is the additional financial burden imposed on businesses by mandated emission control technologies.

Scope

The ARB requested that this research project be directed to the following three industries:

- Electric Utilities;
- Petroleum producers, refiners, and marketers; and
- Chemical manufacturing.

Generally, the accounting practices and tax regulations, relevant to analyzing the financial impact of an investment in pollution control equipment, do not vary widely among the above industries, with the clear exception being the electric utility industry. Separate discussions of the practices and regulations applicable to the electric utility industry are found throughout each subject area of the following report.

Although not a requirement under this contract, we deemed it appropriate to develop a computerized financial model demonstrating the suggested problem methodology. This financial model was used in preparing the hypothetical case studies found in the final chapter of this report.

Limitations

Analysts using the materials presented in this report should only attempt to apply them to the analysis of prospective pollution control investments. This limitation is due to numerous significant revisions in federal tax laws (ERTA, TEFRA), new statements from the Financial Accounting Standards Board, and changes in state and federal regulatory policies governing electric utilities. An attempt to apply the tax, accounting, and financial analyses presented in this report to the analysis of past investments could be misleading because of the significant changes referred to above. The analyst should be particularly careful to review later changes in regulatory agency rulings as these can materially affect the outcome of any analysis.

Recent Tax Legislation

Concurrent with completion of the drafting of this report, Congress enacted the Tax Equity and Responsibility Act of 1982 (TEFRA). This recent act provided several changes to existing tax law in areas directly relevant to this study. The provisions of this act applicable to this research study are described in an addendum to chapter two, the chapter dealing with specific tax issues.

Methodology

The report body, following, consists of five chapters dealing with the detail specific considerations relevant to a financial analysis of an investment in pollution control technology. These chapters, in order of presentation, deal with:

- Cost of capital considerations,
- Tax issues and considerations,
- Accounting and financial reporting practices followed in the chemical and petroleum industry,
- Accounting, financial reporting and regulatory issues applicable to the regulated electric utility industry, and
- Two hypothetical case studies demonstrating suggested problem methodology.

The following discussion provides a summary of specific chapter content and the research methodology employed for each topic area.

Cost of Capital - In terms of identifying and listing the traditional and academic approaches for calculating the cost of capital, a number of well recognized managerial finance texts were researched. Those most heavily relied upon are listed in the footnotes to the cost of capital report section. General issues and research findings were confirmed with Price Waterhouse technical specialists.

Historic industry capital structures were developed based upon Federal Trade Commission reports. Representative current costs of capital for selected industries were developed based upon published data using the methodology presented in this report. A summary of relevant variables which could in the future impact a company's capital structure, and industry's cost of capital, was developed based on cited current literature. Possible relevant methods of financing the cost of compliance with pollution regulations has been presented, the source of which is cited current literature.

The chapter contains a comprehensive guide containing narratives and illustrations of the theoretical approaches to determining the cost of capital. Special considerations concerning the appropriate measure of the cost of capital for regulated electric utilities are discussed in Appendix II of Chapter I.

Tax Considerations - This report section contains a narrative description of the relevant Internal Revenue code and California Franchise Tax Board regulations, rulings and interpretations. Our research indicates that most of the relevant tax rules and regulations are similarly applicable to the chemical and petroleum refining industries. The regulated electric utility industry has many tax rules and regulations specific to that industry. These considerations have been separately identified in this report. The few significant Federal/California tax treatment differences have been highlighted. The chapter contains specific examples illustrating the impact of the applicable tax considerations.

Accounting Practices for the Selected Industries - We have utilized Price Waterhouse library information resources, and other sources as necessary, to gather accounting pronouncements, practice aides, research papers, and other relevant documents. These information sources included texts; trade publications; research studies; accounting practice surveys; and promulgations of the Financial Accounting Standards Board, the American Institute of Certified Public Accountants, the Securities and Exchange

Commission, and the Federal Energy Regulatory Commission. In addition, Price Waterhouse industry specialists for the selected industries have reviewed these practice areas and research sources.

Hypothetical Case Study - Although not a contract requirement, two hypothetical case studies were developed for the purpose of illustrating:

- The general approach for analyzing the financial impact of capital investments in pollution control equipment, and

- The contrast in perspective of such an analysis from the viewpoint of:

  - a non-regulated corporation,
  - a regulated electric utility,
  - the rate-paying consumers.

Another benefit of these case studies is that the various accounting, tax and other applicable financial considerations are presented in relative perspective. The case studies were developed utilizing "Visicalc" on an IBM personal micro-computer. The recent TEFRA tax considerations have not been incorporated in the hypothetical cases. The case studies are not designed to provide a detailed analysis of each and every consideration in such an analysis, but rather to provide a conceptual overview of suggested problem methodology. For the detail specific considerations required in such an analysis, the reader is directed to the various specific chapters of this report.

Recommendations

The following recommendations are a result of our observations of the technical on-going requirements of the Air Resources Board Economic and Research staff:

- The Air Resources Board should make provision to periodically review and update this research study. This is necessary because of the significant changes which are introduced by changes in tax laws and regulatory agency policies.

- The Air Resources Board should consider implementing a microcomputer based financial model capability. A financial model encompassing all of the aspects outlined in this study is very feasible.

- The Air Resources Board staff should make use of outside expert financial consultants periodically to assist in board hearings and help accumulate relevant information.

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CHAPTER I

COST OF CAPITAL

INTRODUCTION

The California Air Resources Board (ARB) is charged with the task of reducing industrial, commercial, and individual pollution in order to attain air quality goals adopted by the state and national governments. A significant factor to be considered in evaluating alternative paths towards these air quality goals is the financial burden imposed on private businesses by mandated emission control technologies.

Many air quality control goals can only be attained by installing expensive capital equipment specifically designed to reduce or eliminate emissions of pollutants that are created during various industrial processes. Many pollution control technologies require the expenditure of substantial sums of money over a number of years for capital and operating expenses associated with the control process. The analysis of these multi-year spending commitments can be facilitated by the application of the basic tools of investment decision making theory. A central concept to this subject is the use of discounting techniques to convert a stream of future cash flows (be it costs or revenues) into a single present value equivalent amount. This amount is referred to as the net present value (NPV) of the future stream of costs and/or revenues.

Crucial to the application of net present value techniques is the selection of the appropriate discount rate for converting future year costs and revenues into a current period equivalent. Financial management literature[1] generally argues that the appropriate discount rate for capital investment analysis is a firm's marginal cost of capital. (The reader is referred to Appendix II of this chapter for a discussion of the special issues related to regulated electric utilities. The choice of the marginal cost of capital is based on the theory that it is the rate of return required on a new investment such that the new investment will

leave unchanged the market price of a firm's stock. In the broadest sense, the cost of capital is the required rate of return needed to justify the use of capital for a given investment project.

A General Method for Measuring the Cost of Capital is Derived from the Present Value Formulation

In general, the cost of obtaining capital from any source is the discount rate that equates the present value of the funds received (net of flotation and other costs) with the present value of expected outflows. The outflows may be in the form of interest payments, repayments of principal, or dividends.[2] Mathematically, this is determined by solving the following formula for the cost (k) of a source of capital:

$$I_o = \frac{c_1}{(1 + k)^1} + \frac{c_2}{(1 + k)^2} + \ldots\ldots + \frac{c_n}{(1 + k)^n}$$

where: I_o = funds received (net of underwriting and other costs) at time zero

c_t = outflow in period t (interest payments, principal repayments, dividends)

n = the year in which financing is repaid

Note that this information is based on expected costs, rather than historical costs. Only the expected costs are relevant, because they are the costs that will be incurred if the firm decides to seek additional capital. Estimates of the expected costs associated with each component of the firm's capital structure are derived from the rates of return required by investors in the capital markets. Historical (imbedded) costs of capital are useful only as possible indicators of the magnitude of future costs.

Cost of Capital --- Defined

In economic terms, capital may be thought of as just another of the resource inputs that a firm requires to produce the products it sells in the market. Like labor, energy, and raw materials,

capital has a price. Firms seek to minimize their cost of capital by choosing a capital structure (a mix of debt and equity) which allows the firm to acquire capital at the lowest market price consistent with the overall level of risk the capital market attaches to the operations of the business.

The cost of capital for a firm may be defined as the weighted average of the after-tax cost of each type of capital used by the firm. The most common types of capital include bank loans, bonds, notes payable, preferred stock, common stock, and retained earnings. The weight for each type of capital is the ratio of the value of the security representing each type of capital to the value of all securities issued by the company. The term security includes common and preferred stock and all interest bearing liabilities of the firm[3].

CAPITAL INVESTMENTS - A CONCEPTUAL DISCUSSION

Meaning of the "Price" of Capital

The "price" of any type of capital may be thought of as the expected future return that the firm must offer investors for use of their capital. This return must induce investors to defer current consumption and instead, allow the firm to use funds in the present to create a future stream of revenues. This "price" may be thought of as consisting of three components:

- The rent paid for the use of money, commonly referred to as the time value of money. (The cost of the investor postponing current consumption to the future).
- The premium paid as compensation for anticipated changes in the general price level (the inflation adjustment).
- The premium paid as compensation for incurring both the operating and financial risks attached to the business.

Assuming that capital markets are efficient, the first two components of the price of capital may be thought of as general costs that are the same throughout the economy at any given point in time. These two cost components are embodied in the so-called

"risk-free" rate of interest - that typically attached to federal borrowing where the risk of default is extremely small[4]. Over time, these first two cost components may vary with changes in expected rates of inflation and investor preferences for future versus current consumption.

The final component of the "price" of capital varies greatly among businesses at any given point in time. This is the risk "premium" attached to investments in any business. The risk premium compensates the investor for the fact that the return on a given investment is not guaranteed. For bond or note holders, this risk is the possibility of the firm going bankrupt. For common stockholders (partners or sole proprietors in an unincorporated business), the risk encompasses both the risk of bankruptcy and the more common situation where dividends are reduced or eliminated in periods of financial difficulty. Capital markets evaluate each firm and assign a risk premium to it based on an assessment of the history, operating characteristics, and future prospects of the business.

It is useful to keep these components of the "price" of capital in mind when considering the cost of capital. The "cost of capital" is not a single fixed price for all firms. The cost varies between firms in the economy at the same moment in time due to different market assessments of the risk attached to investments in different businesses. The cost also varies over time for the same firm due to changes in the risk-free rate of interest as well as to changing market assessments of the risk attached to a given business. As a result, the cost of capital is a dynamic concept that must be evaluated on a firm-by-firm basis each time a new decision is to be made using the cost of capital as a decision making factor.

Rational Investors Seek to Maximize their Returns[5]

Contemporary finance theory assumes that capital investors make decisions on a rational economic basis. Capital investors exhibit rational behavior by attempting to achieve the highest available

return associated with the level of risk they are willing to assume. Given two assets that are equally risky, the rational investor will choose the one with the highest expected return. Faced with two investments promising the same expected return, the rational investor will choose the asset with the smaller risk.

Capital Structure

The source of long-term capital may be any of the following components of the liability and net worth side of a firm's balance sheet:

- Debt
- Preferred stock
- Common stock
- Retained earnings

Raising capital from the first three sources entails explicit costs, including flotation costs, interest payments, and dividends. The fourth source, retained earnings, entails an implicit opportunity cost because reinvestment of retained earnings by the firm requires that shareholders forego additional dividends. The costs of capital from each of these sources are combined to determine the overall cost of capital to the firm.

Financial management theory traditionally maintains that firms manage their financial (or capital) structure in order to minimize the cost of capital. This is achieved by selecting the ratio of debt to equity financing that produces the lowest weighted average cost of capital. The addition of debt to a firm's financial structure lowers the average cost of capital because of debt capital's cost advantages, which are:

- The interest rate on debt is normally lower than that on equity because of its higher legal priority of payment.
- Unlike dividends, interest payments qualify as a tax deduction so that some portion of these charges is borne by the federal and state governments as reductions in tax liabilities. This effect reduces the after-tax cost of debt.

- In periods of general inflation, debt is made cheaper in the long run if the rate of increase in the price level exceeds the anticipated inflation rate built into the borrowing rate at the time debt is issued.[6]

Up to a point, additions of debt to the capital structure of the firm will lower the cost of capital for a firm. However, as the ratio of debt to equity (also referred to as "leverage") increases, the increasing financial risk involved in the firm will begin to cause equity investors as well as potential debt holders to increase the expected rate of return they require in order to compensate them for increased financial risk. As fixed debt payments become a larger and larger share of net earnings before interest payments and taxes (EBIT), the firm incurs greater risk of default or bankruptcy should it experience adverse conditions. As debt increases relative to a fixed amount of equity, there is a relatively smaller amount of "cushion" provided to lenders from equity capital. As a result, lenders begin to demand a greater return to compensate them for their greater risk. Prospective common stockholders will also demand a higher rate of return for their investment since increased leverage increases the volatility of future earnings after interest and taxes.

The example in Appendix 1 illustrates how capital structure can be managed to produce a lower overall cost of capital.

Capital structure varies greatly across industries and among firm's within the same industry. The following tables illustrate this diversity.

TABLE 1

VARIATIONS IN CAPITAL STRUCTURE
WITHIN A SINGLE INDUSTRY
(selected natural resources (fuel) companies, 1981)

Industry	Short & Long-Term Debt as % of Total Invested Capital	Common Equity as % of Total Invested Capital	Preferred Stock as % of Total Invested Capital
Industry Average	30.9%	68.4%	0.7%
Crystal Oil	77.9	22.0	0.1
Exxon	23.5	76.5	0.0
General American Oil Co. of Texas	1.7	98.3	0.0
Lear Petroleum	69.2	30.8	0.0
Marathon Oil	42.4	57.6	0.0
Mobil	30.5	69.3	0.2
Standard Oil Co. (Ohio)	52.7	47.2	0.1
Standard Oil Co. (CA)	13.9	86.0	0.1

Source: Business Week, March 1, 1982 p. 72

TABLE 2

CAPITAL STRUCTURE IN SELECTED INDUSTRIES
(1981)

Industry	Short & Long-Term Debt as % of Total Invested Capital	Common Equity as a % of Total Invested Capital	Preferred Stock as % of Total Invested Capital
Aerospace	28.4%	64.2%	7.4%
Airlines	60.9	36.6	2.5
Automotive	33.0	64.4	2.6
Building Materials	43.1	53.4	3.5
Chemicals	37.5	61.1	1.4
Conglomerates	45.5	51.6	2.9
Drugs	23.5	76.3	0.2
Electrical, Electronics	28.4	70.3	1.3
Food Processing	32.3	66.2	1.5
General Machinery	27.9	71.9	0.2
Instruments	26.8	73.1	0.1
Leisure	24.6	75.1	0.3
Metals and Mining	33.6	64.6	1.8
Misc. Manufacturing	30.8	67.1	2.1
Natural Resources (Fuel)	30.9	68.4	0.7
Office Equipment, Computers	22.4	77.4	0.2
Oil Service and Supply	28.8	69.2	2.4
Paper	34.4	63.2	2.4

TABLE 2 (Continued)

CAPITAL STRUCTURE IN SELECTED INDUSTRIES

Industry	Short & Long-Term Debt as % of Total Invested Capital	Common Equity as a % of Total Invested Capital	Preferred Stock as % of Total Invested Capital
Publishing, Radio, and TV	26.7	71.1	2.2
Railroads	36.9	61.1	2.0
Real Estate and Housing	58.5	41.0	0.5
Retailing (Food)	45.5	51.1	3.4
Retailing (Nonfood)	47.2	52.8	0.0
Service Industries	52.3	46.8	0.9
Steel	30.7	69.0	0.3
Textiles	31.9	66.3	1.8
Trucking	37.6	61.4	1.0
Utilities	50.6	42.2	7.2
All Industry Composite	38.4	58.8	2.8

Source: Business Week, March 1, 1982, p. 53-82

Tables 3 and 4 illustrate the historic aggregate capital structure of the chemical, petroleum and public electric utility industries over the twenty year period 1960-1980. The data was drawn from Federal Trade Commission and U.S. Department of Energy publications.

The data indicates that while there has been some fluctuation over time, the capital structure of the utility industry has been relatively stable over the last 20 years. There has been a slight shift away from debt towards reliance on preferred stock and common equity, two more expensive forms of capital. In both the chemical and the petroleum industries there has been a steady shift towards more use of debt and less reliance on equity. In part, this reflects the advantages of debt financing in inflationary times. It also reflects some reluctance to sell more equity in a depressed stock market such as that characterizing much of the 1970's. The reader should be careful to note that these tables are based on aggregate financial data from the respective industries. The historic capital structure of individual firms may vary widely from the industry average.

TABLE 3

CAPITAL STRUCTURE IN THE CHEMICAL AND PETROLEUM INDUSTRIES (1960 - 1980)
(Percent)

CHEMICAL INDUSTRY

Year	Long Term Debt	Common Equity and Preferred Stock
1960	18.8	81.2
1970	29.0	71.0
1980	30.9	69.1
1981	32.6	67.4

Petroleum Industry

Year	Long Term Debt	Common Equity and Preferred Stock
1960	15.2	84.8
1970	22.3	77.7
1980	22.4	77.6
1981	25.7	74.3

Source: Federal Trade Commission, Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations. (Washington, D.C., Fourth Quarter 1960, 1970, 1980).

Figures drawn from the "Chemical and Allied Products" and "Petroleum and Coal Products" categories in FTC reports.

TABLE 4

CAPITAL STRUCTURE OF INVESTOR OWNED ELECTRIC UTILITIES 1960 - 1979 (Percent)

Year	Long Term Debt	Preferred Stock	Common Equity
1960	52.8	11.0	36.2
1965	51.5	9.5	39.0
1970	54.8	9.8	35.4
1975	52.3	12.4	35.3
1979	50.1	12.4	37.5

Source: U.S. Department of Energy, Statistics of Privately Owned Electric Utilities in the United States (Washington, D.C. various years.

Weston and Brigham[7] note six factors which influence the choice of capital structure:

1. Growth rate of future sales
2. Stability of future sales
3. Competitive structure in the industry
4. Asset structure of the firm
5. Lender's attitudes towards the firm and industry
6. Attitudes towards risk of owners and managers.

These variations in optimal capital structure, a function of investors' perceptions of the risk involved in a given business, mean that different industries (as well as different firms in the same industry) will have different costs of capital.[8]

COST OF CAPITAL CALCULATIONS FOR SPECIFIC FORMS OF CAPITAL

In this section, the general formulation of the cost of capital is extended to specific types of securities. The discussion that follows is based on two assumptions regarding the firm's business policy:

- Constant business risk -- the decision to invest in any particular project does not change investors' overall perceptions of the riskiness of the firm
- Constant capital structure -- the mix of financing instruments (various types of debt and equity) remains in fixed proportions.

More will be said about these two assumptions later in this chapter.

Cost of Debt[9]

Debt is incurred when a firm raises funds through bond issues, bank loans, privately placed debt, and any other arrangement where the firm is contractually obligated to pay interest on funds borrowed. The "yield" of the lender is a function of the time

structure of annual principal and interest payments. This cost of borrowing must be adjusted to reflect the tax advantage of debt financing. The after-tax cost of debt is given by the following equation:

After tax cost of debt	=	Borrowing rate	x	Tax benefit of such a deduction

The tax benefit of debt stems from the fact that interest payments (as opposed to dividends) are tax deductible. As a result, part of the interest cost of debt is offset by lower federal and state tax payments. The tax benefit of debt is given by the following formula: (1 - marginal tax rate).

This formula assumes that the firm is profitable, and thus subject to corporate taxes. If a firm is unprofitable, there is no tax obligation and the true cost of debt is simply the yield received by lendors. There are a wide variety of specialized debt financing instruments, such as convertible bonds. These instruments involve the issuance of bonds which may be converted to common stock under circumstances specified in the bond covenants. Elaborate analysis is required to account for payment schedules and conversion gains in order to calculate the return to investors and thus the cost of this type of capital.[10]

Cost of Preferred Stock

Preferred stock is a hybrid investment. Like common stock, it has no maturity date and failure to pay a dividend does not force a firm into bankruptcy. Like debt, it commits the firm to periodic payments of a given size. In liquidation, preferred stock has legal precedence over common stock but comes after pure debt instruments.

Since preferred stock generally has no maturity date, it may be considered an obligation of indefinite duration.[11] (Some public utilities do issue preferred stock with mandatory redemption dates. In such cases, preferred stock may be analyzed in the same fashion as debt. For simplicity, we will assume preferred stock has no maturity date in the material that follows.)

The cost of preferred capital is thus equal to:

$$\frac{\text{Expected Total Annual Preferred Dividend}}{\text{Proceeds from Sale of Preferred Stock (Net of costs of issuance)}}$$

Since preferred stock dividends are not tax deductible, no tax adjustment is necessary.

Cost of Retained Earnings

The cost of retained earnings, k_r, is an opportunity cost, not an explicit cost. Retained earnings represent that portion of a business' net earnings after tax that are not distributed to stockholders but are retained for investment in the firm. The opportunity cost is incurred by stockholders who could use the additional dividend income to invest in other investments (with similar risk profiles) that provide a return, k_e, equal to that earned by the firm distributing the dividend.

In analyzing this opportunity cost, consideration must be given to the fact that shareholders who receive dividends must pay personal income taxes and some brokerage fee before they can reinvest their dividends in other securities. Mathematically, the opportunity cost of retained earnings can be shown as:

$$\boxed{k_r = k_e\ (1 - t_p)(1 - B)}$$

where: t_p = the average shareholder's marginal tax rate

B = the average brokerage fee

k_e = the cost of new equity capital

k_r = the cost of retained earnings

For example, if k_e is 10 percent, t_p is 30 percent, and B is 2 percent, the opportunity cost is:

$$\boxed{k_r = .10(1 - .30)(1 - .02) = 6.86}$$

As the example shows, retained earnings are a less expensive source of capital than new equity. Even in the absence of individual taxation or brokerage costs, retained earnings are a cheaper source of capital because they do not involve the flotation costs involved in issuing new common stock. This difference in cost helps explain why corporations often choose to finance expansion or acquisition of other firms with retained earnings rather than distribute all earnings as dividends.

A practical difficulty arises in calculating the cost of retained earnings because an accurate estimate of the average shareholder's marginal tax rate is difficult to obtain. In light of this difficulty, and in order to simplify calculation of the overall weighted average cost of capital, it is commonly suggested that k_e be used as the estimate of k_r, since it represents the maximum value of k_r in the absence of tax and brokerage costs.[12]

Cost of Common Stock

The costs of common stock (equity capital) is the most difficult to estimate. The future returns are comprised of future cash dividends. Since the firm is not legally required to pay dividends, it is only possible to estimate future payouts. As a result, the general approach to computing the cost of this form of capital may not be applicable. In those cases where firms pay no dividends, and are not expected to pay one in the foreseeable future, even more complications are added.

In order to overcome these difficulties, three general approaches are suggested in modern finance literature:

- The cost of equity capital may be constructed by taking a risk-free interest rate (such as that on Treasury notes) plus a risk premium to compensate for the business and financial risks associated with a given investment.[13]
- The cost of capital may be calculated using the discounted cash flow method (DCF), also referred to as the "dividend plus growth" model.[14]

- The costs of equity capital may be calculated using the Capital Assets Pricing Model (CAPM).[15]

Each of these approaches will be briefly discussed as well as its value to the tasks facing the ARB staff. There is extensive literature discussing the DCF and CAPM methods. The interested reader may find numerous references in the sources listed in the footnotes above.

- Additional, "subordinated equity" risk premium method

This is the simplest approach to developing a cost of equity capital that is discussed in modern finance literature. It is based on the idea that common stocks are more risky than are corporate bonds, so if yields on corporate bonds are i percent, expected yields on common stocks will be greater than i by the amount of an additional, "subordinated equity", risk premium. This may be written as:

expected yield on common stock	=	corporate bond rate of return	+	an additional equity premium

In this method it is implicitly assumed that corporate bond interest rates (an explicit figure that is directly observable) reflect the risk-free rate of interest (a combination of the time value of money and compensation for expected inflation) available on government securities plus a premium for the business risk involved with debt obligations. The risk premium represents an additional rate of return required to compensate for the extra risk involved with the uncertain pattern of earnings on common stock.

The difficulty with this approach is finding the appropriate risk premium to add to the yield on corporate bonds. Weston and Brigham[16] suggest that investors add risk premiums of from two to five percent to the bond rate of interest of relatively safe, stable companies with high bond ratings. Higher risk premiums would be added to the bond rates of riskier companies. Weston and Brigham present estimates of the range of rate of return on common stocks based on this approach which range from 13 percent for low

risk stock to 20 percent for high risk stocks in an environment where inflation was approximately eight percent. They emphasize that their figures were based partly on statistical data and partly on judgment and as such, must be approached with caution.

From a practical point of view this approach provides the simplest method of computing the required yield on common stocks (k_e) for companies that have bonds traded on the open market. The latest yield on a company's bonds may be found in one of the bond service's publications[17] and an additional subjective risk premium may then be added. The difficulty with this approach is that it requires a relatively arbitrary judgment about the "riskiness" of the firm and the proper risk premium to assign to the business.

- Discounted cash flow method (DCF)[18]

The Discounted Cash Flow Method also known as the dividend valuation model, assumes that the value of a share of stock to investors can be viewed as the present value of the expected future stream of income paid to them.[19]

Based on relevant assumptions, it can be shown that the discount rate k_e, the cost of equity capital, is given by:

$$k_e = \frac{D_1}{P_o} + g$$

where: D_1 = the expected dividend at the end of the current year,
P_o = the current stock price
g = the constant growth rate of dividends.

For example, if a company's expected dividend is $2, the current stock price is $20, and dividends per share are expected to grow at four percent per year, the company's cost of equity capital would be:

$$k_e = \frac{2}{20} + .04 = 14 \text{ percent}$$

To the extent that the past growth trend in earnings per share is felt to be a meaningful predictor of future growth, this trend may be used to estimate g. Where the expected growth rate is expected to be at one level for a certain period of time and then shift to another more normal long-run rate, the discounted cash flow model can be modified to reflect these different growth rates.[20]

The difficulty with this method is that g, the constant future growth rate, is not directly observable in the market and must be estimated. This requires a great deal of judgment as well as extensive information about the firm's plans and market conditions. A further difficulty arises in the case of firms that do not pay dividends at the current time and who have no immediate plans to do so. While much information can be gathered from the financial press and other sources about a firm's plans and growth potential, the discounted cash flow approach does not lend itself to a "naive" computation of k_e. It tends to require an intimate knowledge of a firm's strategic plans in order to estimate g. Notwithstanding these problems, this approach has been utilized by Myron Gordon to estimate the cost of capital for Boston Edison Company in a 1977 rate case.[21]

- <u>Capital asset pricing model (CAPM)</u>

The Capital Asset Pricing Model (CAPM) represents one of the chief foundations of modern security and capital market analysis. This model provides a method of estimating the returns investors <u>expect</u> to earn from common stocks using only data available from stock market prices and dividend records. Unlike the DCF method, it does not require intimate and subjective information about the future earnings pattern of a given company. Unlike the risk-free rate plus a risk premium approach, it does not require a subjective judgment about the appropriate risk premium to assign to a given company. The CAPM is grounded in the basic assumption that the capital market sets stock prices efficiently. This means that all information about a firm and its projected earnings is reflected in the market price of the stock.

A complete discussion of the derivation of the Capital Asset Pricing Model is clearly beyond the scope of this report. The following material will briefly summarize the CAPM and how it may be used to estimate the cost of equity capital. The interested reader is directed to the references noted in the footnote for a more complete exposition of the CAPM.[22]

According to the theory underlying CAPM, when investors purchase shares in a company they are assuming risk. Since investors can always purchase a certain return by investing in risk-free government securities, investments in common stock must be accompanied by a greater return (a combination of a risk free rate of interest and a risk premium) in order to compensate the investor for greater risk. Risk is defined as the variation of the actual return on an investment around the expected return at the time of purchase.[23]

CAPM divides the risk attached to common stock into two contributing sources:

- Systematic Risk - Risk that economywide changes will affect all stocks in the market where the stock is traded.
- Unsystematic Risk - Risk that reflects factors uniquely affecting individual firms.

CAPM can be used to measure statistically the systematic risk attached to a given stock. Unsystematic risk is not an issue in CAPM because it is assumed that the efficient investor can always diversify his or her portfolio of investments such that the unsystematic risk of any individual stock is nullified by the countervailing unsystematic risks of other stocks. Based on this portfolio concept, CAPM argues that the expected return on any share of stock (k_e) is a function of the risk-free rate of interest plus a risk premium proportional to the individual stock's systematic risk relative to the stock market as a whole.[24]

What does this all mean for our purposes? It implies that the greater the covariance between the return on an individual security and the market portfolio, the greater the risk and the greater the expected return that is required on a given stock. By the same token, the lower the covariance of returns, the lower is the level of risk and hence the lower the expected return required on a given stock.

This approach to determining the expected return on a given stock can be made operational by use of statistical regression techniques. Using historical data about stock prices, dividends, and the rate of interest on risk-free government securities, it is possible to estimate the risk premium attached to a given stock.[25] In the financial literature, this is referred to as the "beta" of a given stock. It is a crucial concept in developing a measure of the risk premium for a given stock.[26]

Once the "beta" estimate has been developed from the regression model that processes historical data, the estimated "beta" can be inserted into an equation to estimate the current expected return on a common stock.[27]

Fortunately, much of the complex statistical work needed to use this approach to finding the current expected return on a common stock has already been done by others. An estimate of the historical value of the expected market risk premium of the stock market as a whole has been computed by Ibbotson and Sinquefield.[28] This estimate is based on the observed difference between the return on the Standard and Poor's 500 stock index and the yield on treasury notes over a 51 year period. They report the following results:

- The arithmetic mean return on common stock is 11.6%.
- The arithmetic mean return on U.S. treasury notes is 2.4%.
- The common stock risk premium (R_m - R_f), based on arithmetic mean return, is 9.2%.

This 9.2% rate was used in a recent study of the cost of capital that was prepared for the U.S. Department of Energy.[29]

Estimates of "beta" are available from several investment services. The Value Line Investment Service, for example, computes a "beta" for traded stocks it reviews in its publications. A stock with a "beta" equal to 1 has the exact same risk complexion as the stock market as a whole, and thus the same risk premium. A stock with a "beta" larger than 1 is riskier than the market as a whole and thus has a higher risk premium. A stock with a beta less than 1 is less risky than the market and thus has a lower risk premium. For example, if we use a risk-free rate of 12%, and the average market risk premium discussed above (9.2%) the expected return k_e on a stock with a "beta" of 0.8 would be given by:

$$\boxed{k_e = .12 + (0.8)(.092) = .1936}$$

Before leaving this discussion of the CAPM, it is important to note one crucial assumption about the use of this method to estimate the expected return on a stock. This key assumption is that the past relationship between a stock's return and the market return (ie: the stock's "beta") will hold true for the future.[30] Beta's have been found to be unstable over time. Instability is due to such factors as changes in the basic business practices of the company, changes in firm financial structure, and statistical estimation errors in the regression models. For example, over a recent three year period the estimated "beta's" for a sample of large companies displayed a good deal of change.[31]

This instability does not mean that CAPM is useless. These difficiencies however, should be judged relative to the other techniques discussed earlier. CAPM does not require the arbitrary choice of a risk premium required in the risk-free rate plus risk premium approach or the detailed knowledge of a company's growth plans required by DCF. Financial literature recognizes the limits of CAPM but suggests that it is still a very useful tool for the difficult job of estimating the cost of equity capital.[32]

Flotation Costs - The Effect on Cost of Capital Calculations

Once the expected return on debt, preferred stock, and common stock has been estimated by the methods discussed above, it is necessary to adjust the cost of each type of capital for the cost of issuance (flotation costs). When a company issues new debt, preferred, or common stock, it typically does not receive an amount of money equal to the market sales price of the new shares or bonds created. Some portion is retained by the broker handling the sale of the new issue. Generally, flotation costs (F) as a percentage of the total issue are lower, the larger the amount of the new issue.

This adjustment can be made as follows:

$$k = (\text{expected return}) \times \frac{1}{(1 - F)}$$

where the expected return is estimated by the techniques discussed above and F is the flotation cost as a percentage of the value of the new issue. One recent estimate of these costs for the sale of $30 million in equities placed them at 3.63% as of early 1979. Costs for preferred stock issues were approximately 1.5% and those for debt issues were 1.2%.[33]

OVERALL COST OF CAPITAL

Once the costs associated with the individual sources of capital are computed, they must be combined to obtain an overall cost of capital. This is accomplished by developing a weighted average cost where the weights are the proportionate share of each type of capital in the capital structure of the company. This may be written as:

$$k = \frac{Dk_d}{K} + \frac{Pk_p}{K} + \frac{Ek_e}{K} + \frac{Rk_r}{K}$$

where: k = overall weighted average cost of capital

K = total capitalization of the firm (long term debt + equity + preferred stock + retained earnings)

D = capital from long term debt

P = capital from preferred stock

E = capital from common stock

R = capital from retained earnings

and k_d, k_p, k_e, and k_r are the expected returns on the various types of capital.

This method of calculating the cost of capital is <u>future</u> oriented rather than historic. It estimates each expected return at its <u>current</u> value, not based on the past rates of return on each source of capital.

The use of the weighted average cost of capital approach is also based on two key assumptions:

- New investments will be financed from sources of capital in the same proportions observed in the firm's current capital structure. If the firm altered its capital structure, the weights would change and thus the cost of capital.
- The new investment will not change the overall risk complexion of the company. This assumption implies that the firm's "beta' will remain unchanged. If the assumption does not hold, the firm's "beta" will change and so will the cost of capital.

In practice, specific projects may be financed with financial "packages" that do not maintain the exact proportions of the existing capital structure. Variations from the target capital structure may be due to the availability of favorable rates on

specific sources of capital at a certain time or the transaction costs involved with small issues of a particular type of security. Over time, however, the firm can be expected to finance successive projects in ways that bring the weights into line with the target capital structure.

These two assumptions are important in order to arrive at a cost of capital estimate. The fact that in the real world neither is likely to hold true in a particular case highights once again the fact that cost of capital figures are merely estimates. A thorough understanding of the forces affecting the particular firm, its industry, and the financial market are important in order to assess the reasonableness of a given estimate and its applicability to future decisions.

AN ILLUSTRATION

An example of the process of calculating the cost of capital may be helpful in summarizing the material covered above. (As discussed in the section on retained earnings, we will combine retained earnings and new stock capital as a single entity called common equity.)

Company Capital Structure

	Dollar Value	Elements as a Percentage of Total Debt and Equity
Debt	$100	50%
Preferred Stock	26	13%
Common Equity	74	37%
Total Debt & Equity	$200	100%

Component Costs

Debt Assumptions:

- Average return on newly issued debt — 12.0%
- Flotation costs as percentage of the debt issue — 1.2%
- Marginal corporate tax rate as a percentage — 46.0%

Definition:

$$\text{Cost of debt} = (\text{average return on new debt}) \times \frac{1}{(1\text{-flotation costs})} \times (1\text{-tax rate})$$

$$= (.12) \times \frac{1}{(1 - .012)} \times (1 - .46)$$

$$k_d = .066 \text{ or } 6.6\%$$

Preferred Stock Assumptions:

- Average return on newly issued preferred — 13.0%
- Flotation costs as a percentage of the preferred stock issue — 1.5%

Definition:

$$\text{Cost of preferred} = (\text{Return on preferred}) \times \frac{1}{(1 - \text{flotation cost})}$$

$$= .13 \times \frac{1}{(1 - .015)}$$

$$k_p = .132 \text{ or } 13.2\%$$

Common Equity Assumptions

Expected return on equity:

- Stock "beta" = .80
- Current risk-free interest rate = 12.5 %
- Expected market risk premium = 9.2 %

Calculation of expected return: $k_e = .125 + (.80)(.092)$

$= .1986$ or 19.86%

- Flotation costs as a percentage of the common stock issue — 3.6 %

Definition:

$$\text{Cost of common equity} = (\text{expected return}) \times \frac{1}{(1 - \text{flotation costs})}$$

$$= .1986 \times \frac{1}{(1 - .036)}$$

$$k_e = .206 \text{ or } 20.6\%$$

Weighted Average Cost of Capital

Component	Weight	Cost	Contribution to Weighted Cost (weight x cost)
Long Term Debt	50%	6.6%	.0330
Preferred Stock	13%	13.2%	.0172
Common Equity	37%	20.6%	.0762
Total	100%		.1264
Weighted average cost of capital			12.64%

As the example illustrates, the company's capital structure is reviewed to provide the weights required to calculate the weighted average cost of capital. The individual component costs are then calculated based on the considerations discussed earlier in this section. Finally, the products of the weighting factor and the individual component costs are summed to arrive at the weighted average cost of capital. This methodology can be applied to individual companies in order to develop individual cost of capital estimates.

CALIFORNIA AIR RESOURCES BOARD
COST OF CAPITAL

A SUMMARY

The object of the discussion of the cost of capital is the conversion of a stream of present and future cash flows into a single present value equivalent amount. The selection of an appropriate discount factor is critical to the application of net present value techniques. This discount factor is also synonomous to a firm's cost of capital. The cost of capital for a firm may be viewed as the weighted average of the after-tax cost of each type of capital used by the firm - be that debt or equity instruments.

The cost (or price) of capital comprises three elements of compensation:

- An interest factor to compensate for the time value of money
- An inflation factor to anticipate changes in the purchasing power of the dollar
- A risk factor to compensate the long run risk of loss of an investment.

The interest and inflation factors are embodied in what is known as the "risk-free" rate of interest - which is analogous to the rate assigned to such a minimum risk investment as a U.S. Government bond. The risk factor varies greatly between firms and over time for the same firm.

The outline following, "An Outline Illustrating the Process of Determining a Firm's Representative Cost of Capital", describes in a condensed form, the factors leading to the calculation of a firm's cost of capital. Similar, more focused, outlines are also presented describing the cost of capital for each of the elements of a firm's capital structure: long term debt, preferred equity, and common equity.

AN OUTLINE ILLUSTRATING THE PROCESS OF DETERMINING A FIRM'S REPRESENTATIVE COST OF CAPITAL

1. Research the subject company or industry and critically evaluate analytical risk factors

2. Determine capital structure of the firm and the weights assigned to debt and equity

3. Determine cost of capital of each element of the firm's capital structure

   - Debt
   - Preferred stock
   - Common equity

4. Determine the weighted average cost of capital

ILLUSTRATION OF THE PROCESS OF CALCULATING THE COST OF DEBT

- Determine the average rate of return for comparable newly issued debt
- Determine flotation costs as a percentage of the new debt issuance
- Identify the marginal corporate tax rate

Definition of cost of capital for debt:

$$\text{(Identified rate of return on debt)} \times \frac{1}{\text{(1 - flotation costs (as a decimal))}} \times \text{(1 - the identified marginal tax rate)}$$

ILLUSTRATION OF THE PROCESS OF CALCULATING THE COST OF PREFERRED STOCK

- Determine the average return on newly issued preferred stock which may be identified as:

$$\frac{\text{Expected total annual preferred dividend}}{\text{Proceeds from sale of preferred stock (net of costs of issuance)}}$$

or which may also be expressed as:

$$\frac{\text{expected annual dividends}}{\text{current preferred stock price}}$$

- Determine flotation costs as a percentage of the preferred stock issue

Definition of cost of capital rate for preferred stock:

$$\text{(Identified rate of return on preferred stock)} \times \frac{1}{(1 - \text{flotation cost})}$$

ILLUSTRATION OF THE PROCESS FOR CALCULATING THE COST OF CAPITAL FOR COMMON EQUITIES

- Identify the "beta" for the firm's common stock (for example, - consult The Value Line investment service)
- Determine the current risk-free interest rate (i.e., the rate for government borrowings)
- Determine the "common stock market risk premium" (Ibbotson and Sinquefield identified a rate of 9.2%)
- Calculate the expected return on common equities - defined as:

(The risk-free rate) + (The common stock market risk premium) x (Identified beta)

- Determine flotation costs as a percentage of the common stock issue

Definition of the cost of capital for common equities:

$$\text{(expected return on common equities)} \times \frac{1}{(1 - \text{flotation cost (as a decimal)})}$$

RANGE OF ESTIMATED COSTS OF CAPITAL FOR FIRMS IN THE UTILITY, PETROLEUM, AND CHEMICAL INDUSTRIES

Table 5 provides a range of estimates for the cost of capital in the three industries selected for study. The estimates were calculated based on the methodology discussed in the cost of capital section of this report. Data for the calculations was drawn from published sources. Data sources and key assumptions used in these calculations are discussed in the notes accompanying Table 5. The table clearly illustrates the effects that different capital structures, "Beta's", and bond ratings can have on the cost of capital to individual firms both within and across industries.

The reader should note that the historically high inflation rates of recent years have caused the interest rate on Federal Treasury notes to remain well above 10% for a long period of time. Since this rate is used as the "risk free" rate in calculating the return on equity, the high levels of interest rates during the period applicable to Table 5 help to explain the high cost of equity shown on the table. The impact of these high interest rates for "risk free" federal notes can be illustrated by noting that if the rate on federal treasury notes fell to 8%, then the cost of equity shown on Table 5 would fall by 3.5 percentage points and 6.7 percentage points, respectively, in the low and high range estimates shown.

Table 5

Estimated Weighted Average Cost of Capital
for Selected Publicly Traded Firms

Company	Capital Structure(%) Debt	Equity (a)	Prefer.	"BETA" (b)	Bond Rating (a)	Cost of Equity (%) Low (c)	High	After Tax Cost of Debt(%) Low (d)	High	Cost of Prefer. (%) Low (e)	High	Weighted Average Cost of Capital(%) Low (f)	High
Electric Utilities													
Pacific Gas & Elec	44.5	40.5	15	.55	A	17.06	20.50	8.69	9.40	14.11	15.84	12.89	14.86
San Diego Gas&Elec	47.9	38.2	13.9	.5	Baa	16.60	20.02	9.02	9.89	15.13	16.14	12.76	14.63
So. Cal. Edison	47.5	38.9	13.6	.65	Aa	18.00	21.45	8.09	9.24	13.60	15.43	12.69	14.83
Petroleum Industry													
ARCO	28	71.6	.4	1.15	Aaa	22.67	26.22	7.49	8.36	14.62	16.45	18.38	21.18
EXXON	15.7	84.3	0	.85	Aaa	19.86	23.36	7.49	8.36	14.62	16.45	17.92	21.01
Gulf Oil	12.8	87.2	0	1.15	Aaa	22.67	26.22	7.49	8.36	14.62	16.45	20.72	23.94
Mobil Oil	21.5	78.5	0	1.1	Aaa	22.20	25.75	7.49	8.36	14.62	16.45	19.04	22.01
Occidental	30.5	59.5	10	1.25	A	23.60	27.18	8.36	8.80	14.62	16.45	18.05	20.50
Phillips	12.4	87.6	0	1.3	Aaa	24.07	27.65	7.49	8.36	14.62	16.45	22.01	25.26
Shell	26.9	73.1	0	1.2	Aaa	23.13	26.70	7.49	8.36	14.62	16.45	18.92	21.77
Standard (Calif.)	9.1	90.9	0	1.05	Aaa	21.73	25.27	7.49	8.36	14.62	16.45	20.44	23.73
Texaco	15.9	84.1	0	.95	Aaa	20.80	24.31	7.49	8.36	14.62	16.45	18.68	21.78
Union Oil	21.4	78.6	0	1.25	A	23.60	27.18	8.36	8.80	14.62	16.45	20.34	23.24
Chemical Industry													
Air Products	37.3	62.7	0	.95	A	20.80	24.31	8.36	8.80	14.62	16.45	16.16	18.53
American Cyanimid	27.5	72.5	0	1.05	Aa	21.73	25.27	7.87	8.47	14.62	16.45	17.92	20.65
Diamond Shamrock	40.5	59.5	0	1.2	A	23.13	26.70	8.36	8.80	14.62	16.45	17.15	19.45
Grace(W.R.)	38.3	61.4	.3	.95	A	20.80	24.31	8.36	8.80	14.62	16.45	16.02	18.35
Allied Chemicals	34.7	65.3	0	1.2	A	23.13	26.70	8.36	8.80	14.62	16.45	18.01	20.49
Dow Chemical	43.6	56.4	0	1.25	Aa	23.60	27.18	7.87	8.47	14.62	16.45	16.74	19.02
DuPont	15.8	80.7	3.5	1.15	Aaa	22.67	26.22	7.49	8.36	14.62	16.45	19.99	23.06
Monsanto	32.8	67.2	0	1	Aa	21.26	24.79	7.87	8.47	14.62	16.45	16.87	19.44
Stauffer	17.6	82.4	0	.9	A	20.33	23.84	8.36	8.80	14.62	16.45	18.22	21.19
Union Carbide	28	72	0	1	A	21.26	24.79	8.36	8.80	14.62	16.45	17.65	20.31

NOTES:
(a)
(b)
(c) See following page.
(d)
(e)
(f)

NOTES TO TABLE 5

(a) Moody's Public Utilities Manual - 1981 and Moody's Industrial Manual - 1981.

(b) Value Line Investment Survey, various issues in 1981 and 1982.

(c) "Cost of Equity" calculated based on the methodology discussed earlier in this chapter. The following assumptions were used to perform the calculations:

	Low	High
Interest rate on 91 day U.S. Treasury Notes. (Risk free interest rate) (Based on high and low rates experienced between January and June 1982)	11.5%	14.7%
Market risk premium (Source: Ibbotson and Sinquefield)	8.9%	9.2%
Flotation costs	3.6%	3.6%

(d) "After Tax cost of Debt" was calculated based on the methodology discussed earlier in this chapter. The low and high range estimates were calculated based on the January to June 1982 high and low bond costs for each bond rating. Data on bond ratings and corresponding high and low borrowing costs were drawn from Moody's Bond Survey, June 14, 1982, page 1852. The tax effect of debt was calculated based on a federal tax rate of 46%. Flotation costs were assumed to be 1.2%.

(e) "Cost of Preferred" was calculated based on the methodology discussed earlier in this chapter. For utility corporations, the low and high estimates were calculated based on the range of utility preferred stock yield figures for each rating during the period from January to June 1982. Data drawn from Moody's Bond Survey, June 14, 1982, page 1852. Flotation costs were asumed to be 1.5%. Non-utility corporation preferred stock yields were not reported by Moody's. For purposes of this estimate, the low and high figures were assumed to be 1% point higher than those of the highest rated utility.

(f) "Weighted Average Cost of Capital" was calculated based on the methodology discussed earlier in this chapter. High and low estimates were calculated based on the high and low range figures for each type of capital.

VARIABLES AFFECTING THE FUTURE COST OF CAPITAL

Based on the above discussion of the calculation of the cost of capital, it is possible to break down the factors which influence the future cost of capital into five categories.

- Variations in the "risk free" rate of interest. This is chiefly a function of changes in the rate of inflation and the market's expectations about future rates of inflation. It affects both the cost of debt and the cost of preferred and common stock since the rate on risk free government securities fluctuates based on inflationary expectations. The rate on 13 week federal treasury notes can be thought of as the "floor" below which all other rates cannot fall. The historically high rates of inflation in the 1970's played a large part in the higher costs of capital experienced in that decade relative to earlier periods.

  Another significant factor here is the degree of competition between the federal government and the private sector for any given pool of savings. To the extent that federal borrowing needs grow they may "crowd out" private borrowers. This process bids up the rate on tax free federal borrowing and thus drives up rates for private sector borrowers as well.

- Variations in corporate tax rates and other tax policies. Federal and/or state corporation tax rate changes in the future will affect the attractiveness of debt relative to other forms of capital. The tax deductible quality of debt is worth more if tax rates increase, while lower tax rates reduce debt's attractiveness. Other tax policies which reduce corporate tax liabilities (I.T.C., ACRS, etc.) also reduce the attractiveness of debt, all other factors being held constant.

- Variations in the risk profile (Beta) of a firm. Over time the risk profile of a firm will change in response to management policies, diversification of the firm, changes in a firm's markets due to changing consumer tastes and technologies,and a variety of other factors which influence any economic enterprise. As used here, these variations in risk will affect the cost of equity capital.
- Variations in the risk assessments made by lenders. Bond ratings and the risk assessments made by other lenders affect the cost of capital directly by increasing or decreasing borrowing costs. The decline in the bond ratings of electric utilities during the 1970's has been estimated to have added 1.5% to the industry's average cost of capital.[34] Bond ratings may rise or fall due to changes in the ratio of net income to interest charges (coverage ratios), debt to equity ratios relative to industry norms, and other factors used by lenders to evaluate the risk of default.
- Variations in the capital structure of a firm. Factors affecting the choice of capital structure have been noted earlier. Changes in capital structure can directly influence the overall cost of capital as was noted earlier.

POSSIBLE METHODS OF FINANCING POLLUTION CONTROL INVESTMENTS

Conceptually, the financing of pollution control equipment is no different than the process of financing any other capital investment made by a business. The firm will seek to raise capital at the lowest possible cost consistent with its long term objectives. The one exception to this general statement is the use of tax exempt pollution control bonds issued under the auspices of the California Pollution Control Finance Authority (CPCFA). The following section will discuss the CPCFA and then move to a review of more general financing methods.

Tax Exempt Financing

Federal law (Section 103 (b)(4) of the Internal Revenue code of 1954) and conforming state legislation (Section 44500 et. seq. Health and Safety Code) provide a federal and a state income tax exemption on bonds issued to finance air and water pollution abatement equipment. This tax exemption makes such bonds attractive to investors and thus allows the issuer to sell the bonds at a lower (interst rate) cost. As a result, this source of capital for financing pollution control investments is significantly less expensive than other sources of capital for financing such investments.

In California the use of tax exempt pollution control financing is supervised by the California Pollution Control Financing Authority (CPCFA). From 1974 to date, over $700 million in tax exempt pollution control financing bonds have been issued in California. Over $210 million in bonds have been sold by major oil corporations, $137 million by regulated electric utilities, and $28 million by large chemical industry firms. Other industries that have taken advantage of this source of financing include cement, paper, metals, and glass firms. Individual projects ranging from $75,000 to $70,000,000 have been financed by use of these bonds.

A special program has been established to assist small business (through use of Small Business Administration loan guarantees) who normally lack access to bond markets to take advantage of tax exempt financing. Between 1974 and 1981 over $55 million in financing has been provided to small business under this program. Recent reductions in federal SBA loan guarantees threaten to curtail or eliminate this program, since without the 100% SBA guarantee the bond market is unlikely to purchase bonds issued on behalf of small businesses.

The substantial reduction in the cost of capital made possible by use of these tax exempt bond issues can be appreciated by examining a recent $45 million issue sold by Pacific Gas and Electric Company. The issue was sold on June 10, 1982, and carried a net interest cost of 12.46%. During this same week, Moody's Bond Survey (June 14, 1982, p. 1852) reported that public utility bonds sold by a utility with the same bond rating as PG&E (A) carried an average yield of 16.33%. While there are some differences in how net interest cost and average yield are calculated, it is apparent that there are major savings. Another recent issue by a lumber products corporation carried a net interest cost that was 70% of prime rate and varied up and down with the prime rate. In general, the CPCFA indicates that tax exempt financing has carried interest rates that are 2% to 6% lower that those assigned to comparable taxable borrowings.

The process of issuing such bonds requires that the facilities to be financed by the bonds first be certified by the appropriate state agency (ARB or State Water Quality Control Board) as serving to meet pollution abatement purposes. A bond counsel's opinion must be obtained concerning compliance with all requirements for tax exemption. For most large corporations, the normal reviews by underwriters and bond rating services are also performed. Assuming all steps are in order, the bonds can be taken to market. It should be noted that there is currently no ceiling on the total amount of these tax exempt bonds that can be sold in California.

While the CPCFA supervises the issue of tax exempt bonds, state statutes require the Authority to approve sales of bonds by firms with a bond rating of "A" or better. For firms with lower bond ratings, the CPCFA may exercise its judgment as to whether to give final authorization to sell tax exempt bonds.

Finally, it should be noted that these tax exempt financings are not credit obligations of the State of California. They are secured only by the facilities constructed with the proceeds of the financings and the credit of the firms who are building and operating the pollution control equipment.

Conventional Financing Methods

Aside from the use of tax exempt pollution control financing through CPCFA, the financing of pollution control facilities can be considered as merely another part of the general capital financing problem facing any business. Firms will attempt to finance capital projects by selling equity or debt consistent with their target capital structure and current market conditions. The following section discusses several key considerations involved in capital financing decisions.

- **Equity** - the ability of a firm to sell additional common stock to finance capital programs is greatly influenced by the ratio of current market value of a share of stock to the book value of a share of stock. When a firm's stock is selling at less than book value any sale of additional stock will dilute the ownership interest of existing shareholders. Needless to say, managers are not likely to approve such actions which directly contradict the interests of existing owners.

  During the late 1970's and early 1980's, shares of electric utility industry firms, in particular, were selling at market prices substantially below book value. This problem was a reflection of a variety of factors which depressed utility earnings including regulatory lag and delays in placing new generating capacity in

operation. This made it difficult, if not impossible, for the industry to tap equity markets as a source of new capital. As a result, heavier reliance was placed on preferred stock and various types of debt.

Another significant factor affecting the attractiveness of the equity form of financing is the income tax treatment of equity earnings. This is of particular importance to the electric utility industry. The 1981 tax act allows individual shareholders to exclude from income up to $750 of dividends if the dividends are reinvested in utility common stock. This provision is expected to finance up to one third of the $6 billion in new utility equity offerings in 1982.[35]

- **Debt** - As interest rates soared during the 1970's and early 1980's, a wide variety of "innovative" debt financing instruments appeared on the financial markets. All of these instruments had one thing in common: Their purpose was to secure a net interest cost that was lower than the current (high) market rate on conventional bonds or bank borrowings. To obtain lower interest rates, borrowers had to offer lenders some other benefits (lower risk, convertibility, etc.) which would compensate them for the lower net interest payments due. Some of these debt financing techniques are listed below:

  - **Short term debt and commercial paper** - When short term interest rates are below long term rates many firms financed capital projects using short term debt. While lower interest rates were obtained, the cost was the great uncertainty about future financing costs over the life of an investment since short term debt has to be frequently refinanced at interest rates which can fluctuate widely over time.

  - **Eurocurrency offerings** - Large corporations that are well known in national capital markets have borrowed money at lower interest rates in European credit

markets. These lower rates, however, are purchased at the price of greater risk due to currency exchange rate fluctuations. If the dollar declines in value against the currency in which bonds are denominated, the increased dollar cost of foreign currency can wipe out interest rate savings. Hedging the transaction through forward exchange markets can cut this risk but only at an additional cost to the borrower.

- **Variable rate bonds** - These bonds pay interest at a rate that varies up or down with market rates. In many ways it is like the use of short term debt or commercial paper, except that the borrower is guaranteed the use of the funds over a long term. The borrower may originally receive a rate which is lower than the current rate on conventional bonds because the variable rate protects the lender from the risk of a major increase in interest rates at a later date. The borrower, however, assumes this risk of higher future rates, something not faced in conventional borrowings.

- **Convertible bonds** - These are bonds which may be converted into a fixed number of common stock shares at a set price (usually somewhat above current market share prices). Again, a lower interest rate may be obtained on the bond in exchange for the opportunity of a larger gain if stock prices rise. The borrower may have to buy shares on the open market at the higher price (rather than issue new stock) in order to honor the option.

- **Other "Exotic bonds"** - Other financing instruments developed in recent years include zero coupon bonds, drop-lock bonds, bonds with warrants attached, commodity linked bonds, and other hybrid issues. All of these are attempts to give investors some

different mix of return, risk, and timing that will induce them to demand a lower interest rate for the debt issue.

A recent article in the Federal Reserve Bank of New York's Quarterly Review best summed up the impact of these innovative methods of financing:

"Of the different types of unconventional bonds mentioned, only convertible issues were used with any frequency in the past year. However, even those bonds have not comprised a major share of the total volume of funds raised in the bond market. The major reason that none of these alternative types of bonds have become very popular is that, although they offer certain advantages to investors, they also present corresponding disadvantages to borrowers. Only when the value placed on the advantage by the investor is larger than the value placed on the disadvantage by the borrower, will the borrower choose to issue the unconventional bond instead of the traditional, fixed-rate bond." [36]

- **Safe Harbor Leases** - While not strictly a form of financing (such as debt or equity) safe harbor leases are occasionally involved in financing programs for new equipment. The term safe harbor leases refers to those provisions of the Internal Revenue Code which allow firms that have no federal corporate tax liability to "sell" the investment tax credit (ITC) and the depreciation benefits (ACRS) from eligible investments to another firm that does have a tax liability. The ITC, ACRS, and safe harbor leasing are discussed extensively elsewhere in this report. The importance of the safe harbor leasing rules is that they allow firms that cannot benefit from these provisions (due to insufficient tax liabilities) to reap some of the benefits by "selling" them to another firm. This helps to reduce the overall cost of a capital investment and thus lighten the financing burden.

NOTES

1. Managerial Finance, Fourth Edition, J. Fred Weston and Eugene F. Brigham. Chapter 11. (1972)
   Financial Management and Policy, Third Edition, James C. Van Horne. Chapters 4 and 5. (1974)
   For a slightly different approach see The Capital Budgeting Decision: Economic Analysis of Investment Projects, Fifth Edition, Harold Bierman, Jr. and Seymour Smidt. Chapter 12 and 13. (1980)
2. Van Horne, p. 102
3. Bierman, p. 252
4. Cost of Capital and Rate of Return for Industrial Firms and Class A and B Electric Utilities, S. Berkowitz. p. 3-8 (1979)
5. Berkowitz, p. 2-3
6. Capital Budgeting, Clark, Hindelburg, and Pritchard. p. 189-191
7. Weston, p. 264
8. Weston, Chapter 9
9. Van Horne, p. 103-4
10. Van Horne, p. 113
11. The general formula for preferred stock (when the stream of payments stretches to infinity), reduces to:

$$\boxed{I_o = \frac{C}{k_p}}$$

where: C = is the constant annual preferred dividend)

I_o = net proceeds (less flotation costs) of the preferred stock issue

k_p = cost of preferred stock capital

12. Clark, et al, p. 200. This material discusses why depreciation expense is not treated as a separate source of capital in the analysis of the cost of capital.

13. Clark, p. 195 and Weston, p. 293

14. Weston, p. 304-308, Van Horne, p. 105-111, Clark, p. 194-6, and Berkowitz, p 2-13

15. Weston, p. 340, Clark, Chapter 10, Modern Portfolio Theory, Robert Hagin, p. 137-197 (1979), and Berkowitz, p. 2-17 to 2-29

16. Weston, p. 293

17. For information on bond price and yield see Moody's Bond Record: Municipals, Corporates, Governments, Convertibles, and Preferred Stock Ratings. New York, Moody's Investors Service (monthly), or
Bond Guide, New York, Standard and Poor's Corp. (monthly).

18. Van Horne, Chapters 2 and 5

19. Mathematically this can be described as:

$$\boxed{\sum_{t=1}^{oo} \frac{(\text{Dividend})_t}{(1 + k_e)t}}$$

where: k_e = the appropriate discount rate for a firm with a given risk complexion if it is assumed that:

- the firm will continue in business indefinitely.
- dividends will grow at a constant rate, g.
- the discount rate, k_e, is larger than the dividend growth rate, g.

20. Van Horne, p. 108

21. Berkowitz, p. 2-16

22. Van Horne, Chapter 3, Weston, p.333-345, Bierman, chapter 15, Hagin, chapters 19-26

23. Financial management literature assumes that the return an investor expects from a given stock may be described as a probability distribution of possible returns. These returns range from large losses (a low probability of occurrence) to "normal" returns (a higher probability situation) to large profits (again, with a low probability of occurrence). The expected return represents the sum of each possible return times its probability of occurrence. Risky stocks are ones with a larger probability of variance between the expected return and the actual return.

A simple example may illustrate how two stocks with the same expected return can be in different risk categories.

Company A

Return	Probability of Occurrence
$ 0	.5
$2,000	.5

Expected return = ($0) (.5) + ($2,000) (.5) = $1,000

Company B

Return	Probability of Occurrence
$ 900	.333
$1,000	.333
$1,100	.333

Expected return = ($900) (.333) + ($1,000) (.333) + ($1,100) (.333) = $1000

While the two companies have identical expected returns, they obviously vary greatly in the risk attached to the expected return. Stock prices would reflect this risk.

24. More rigorously, under the CAPM the measure of risk attached to a given stock is the marginal effect the security has on the standard deviation, or risk, of the market portfolio of all stocks. Mathematically this may be written as :

$$R_j = i + \frac{Rm - i}{S^2_m} (r_{jm} G_j G_m)$$

where: Rj = the expected return on stock j

i = the risk-free rate of interest

Rm = the expected return on the market portfolio

S^2m = the variance of the return on the market portfolio, and the term (r_{jm}, G_j, G_m) is the covariance between the return for security j and the market portfolio m.

25. Van Horne, p. 485. Based on the work of William Sharp a model that may be statistically estimated using time series data was developed for describing this relationship. This statistical model is conventionally described as follows:

$$E(R_j) = R_f + B_j (E(R_m) - R_f)$$

where: $E(R_j)$ = the expected return on stock j

R_f = the risk free rate of interest

$E(R_m)$ = the expected return on the stock market as a whole

B_j = the coefficient of the market risk premium that specifies the impact of economy - wide factors on the return of stock j

26. For actual purposes of developing a statistical estimate of "B", the following model is used with historical data on the return from a given stock (dividends plus changes in price of the stock during a given period):

$$r_{jt} = A + B_j\ (r_{mt}) + E_j$$

where r_{jt} = the observed risk premium on stock j at time t. (Total return on stock j minus the risk free rate at time t)

A = the intercept of the regression line which is assumed to be 0 (and has been found to be 0 in most studies).

r_{mt} = the observed risk premium or the stock market as a whole. This is usually estimated from the return on a market index such as the Standard and Poors 500. (Total return on the stock market as a whole minus the risk-free rate).

B_j = the stock "beta" over the time period used to statistically estimate the model.

E_j = the statistical residual error term that is expected to equal 0 over the long term. (This expectation is borne out in actual studies).

27. $$K_e = R_j = R_f + B_j(R_m - R_f)$$

where: $K_e = R_j$ = the expected return on comomn stock j at the present time.

R_f = the risk free rate of interest. This is most frequently the current ninety day treasury bill interest rate.

B_j = The "beta" for given stock estimated from the regression equation.

$(R_m - R_f)$ = The expected market risk premium based on the historical average difference between the return on a market portfolio (i.e., the Standard and Poor's 500) and the risk-free rate of interest.

28. Stocks, Bonds, Bills, and Inflation: The Past (1926-1976) and The Future (1977-2000), Roger G. Ibbotson and Rex A. Sinquefield. (1977)

29. Berkowitz, p. 3-8

30. Van Horne, p. 122

31. "The Once and Future Beta", Forbes, February 1, 1982 p. 98

32. "Does the Capital Asset Pricing Model Work?", Harvard Business Review, January-February 1982, p.114.

33. Berkowitz, p.3-16

34. "Our Stake in the Electric Utility's Dilemma," Harvard Business Review, May-June 1982, p. 89

35. "Utilities Get a Charge from the Stock Market," Business Week, September 20, 1982, p. 36

36. "Original Issue Deep Discount Bonds," Quarterly Review, Federal Reserve Bank of New York, Winter 1981-82, p. 21

APPENDIX 1

A Hypothetical Example of the Effect of Capital Structure on the Costs of Capital

Key Ideas

1. The more debt a given firm employs, other factors held constant, the higher its required rate of return on equity capital. This higher return is required to compensate owners for the increased risk that earnings (after interest and taxes) will be more volatile.

2. The more debt a given firm employs, other factors held constant, the higher the interest rate on borrowings. This higher rate is required to compensate lenders for the increased risk of default.

3. Debt usually carries a lower interest rate than equity capital (at low levels of leverage) since debt holders have greater legal claim on the earnings of the business and a higher legal claim on the assets of the firm in case of bankruptcy.

4. The after-tax cost of debt is lower than the pre-tax cost because interest paid on debt is tax deductible. The after-tax cost may be calculated as:

   After tax cost = (Borrowing cost)x(1-tax rate)

   The following example is drawn from Weston and Brigham's book, Managerial Finance (Fourth edition). (See Note 1 for the complete citation).

Example of the Effect of Leverage on the Cost of Equity Capital

Leverage (debt/assets)	Required Rate of Return
0%	12.0%
10	12.2
20	12.5
30	13.0
40	14.0
50	16.0
60	19.5

Example of the Effect of Leverage on the Cost of Debt

Leverage (debt/assets)	Interest Rate	After-Tax Cost (50% tax rate)
0	6.0	3.0%
10	6.0	3.0
20	6.0	3.0
30	7.0	3.5
40	9.0	4.5
50	12.0	6.0
60	17.0	8.5

Weighted Average Cost of Capital At Different Leverage Rates

	Percent of total	Component Cost	Weighted Cost
Debt	0	3.0	0
Equity	100	12.0	12.0
	100		12.0
Debt	10	3.0	.30
Equity	90	12.2	11.00
	100		11.30
Debt	20	3.0	.60
Equity	80	12.5	10.00
	100		10.60

	Percent of total	Component Cost	Weighted Cost
Debt	30	3.5	1.05
Equity	70	13.0	9.10
	100		10.15
Debt	40	4.5	1.80
Equity	60	14.0	8.40
	100		10.20
Debt	50	6.0	3.0
Equity	50	16.0	8.0
	100		11.0
Debt	60	8.5	5.10
Equity	40	19.5	7.80
	100		12.90

As the example illustrates, the firm can reduce its cost of capital by a judicious selection of its debt to equity ratio. This represents the traditional view of financial management literature. It should be noted that some economists (Modigliani and Miller) argue that the cost of capital is independent of firm capital structure. They argue that in perfect capital markets and with no transaction costs in bankruptcy, investors should be able to use their own leverage (ability to borrow) to trade shares in firms so as to cancel the higher costs of equity in highly leveraged firms. They go so far as to argue that with corporate taxes (and their effect on the cost of debt) the cost of capital should decrease with leverage. This school of thought has been attacked on the basis of the reasonability of its assumptions. According to Van Horne, empirical evidence seems to indicate that financial structure does affect the cost of capital, but the relationship is not well defined.

APPENDIX II

COST OF CAPITAL CONSIDERATIONS FOR REGULATED ELECTRIC UTILITIES

When examining the cost of capital in the electric utility industry, the reader should bear in mind the fact that the California Public Utilities Commission (CPUC) is primarily concerned with the imbedded (historical) cost of capital in ratemaking cases, rather than the marginal cost of capital. The primary difference between the two is that the imbedded cost of capital is calculated by using the historic rates of return on debt and preferred stock that a company agreed to pay when it issued that debt or preferred stock in the past. Since a large portion of the existing debt and preferred stock in an electric utility's current capital structure may have been issued in the past when interest rates and preferred stock dividends were significantly lower than today, it is likely that the imbedded cost of capital will differ significantly from the current marginal cost of capital.

The financial analysis literature referred to in Chapter I emphasizes the theoretical appropriateness of using the marginal cost of capital to analyze the impact of incremental investments. This is the measure used for analysis of the non-regulated business. When considering pollution control investments of regulated electric utilities, however, the analyst must examine the effects of using both measures. Since utility rates are set based on the imbedded cost of capital, it is essential to use this measure when considering possible financial impacts on rate payers. The analyst can obtain the most recent cost of capital recognized by the CPUC for specific ratemaking cases for a regulated electric utility by contacting the CPUC. The CPUC determines the cost of capital for individual regulated electric utilities after extensive public hearings.

CHAPTER II

TAX CONSIDERATIONS

COST RECOVERY AND DEPRECIATION

Overview

With the passage of the Economic Recovery Tax Act of 1981 (ERTA), the rules for computing the allowable tax deduction for the recovery of capital investment costs have changed significantly. Prior to the Act, Internal Revenue Code Section 167 and the regulations thereunder provided the law in this area. Now, for virtually all assets acquired after December 31, 1980, Code Section 168 provides a new Accelerated Cost Recovery System (ACRS) which substantially pre-empts the old Section 167 rules.

There are numerous differences between the new recovery rules and the old depreciation provisions. The concept of "cost recovery", although analogous to depreciation, provides for the application of accelerated methods of depreciation for general recovery class periods which are generally shorter than the properties' estimated useful lives. This represents a material departure from the traditional depreciation concept. In addition, ACRS generally provides for statutorily fixed rates of depreciation utilizing one common depreciation method, although an optional straight-line recovery method may also be elected. This is in direct contrast with the variety of depreciation methods available under previous rules which resulted in a wide range of depreciation rates.

Due to these differences, and the fact that for some asset acquisitions the older Section 167 rules may still apply, the ARB analyst must first ascertain the alternatives available and then confirm with the taxpayer the method which will be used in order to properly determine the tax deduction for capital cost recovery.

Accelerated Cost Recovery System

Under Section 168, the capital investment costs for virtually all tangible depreciable property used in a trade or business, which is placed in service after 1980, must be recovered using the Accelerated Cost Recovery System (ACRS). Such property is known as "recovery property." However, there are the following principal relevant exceptions to this requirement:

- Public Utility Property
- Units of Production Method of Depreciation
- Property Subject to Amortization

Other tangible depreciable property not falling within one of the specific exceptions enumerated above is Section 168 recovery property and is subject to the accelerated cost recovery system rules. A more in-depth discussion of these exceptions follows:

- Public Utility Property

  Public utility property[1] does not qualify for ACRS treatment if the entity does not account for post-1980 public utility property acquisitions under the 'normalization' method of accounting. In order to be considered using a 'normalization' method of accounting, a utility must determine its tax expense for book (ratemaking) purposes by including not only income taxes currently payable for a year but also deferred taxes resulting from book-tax depreciation differences. Differences between depreciation expense for book (ratemaking) and tax purposes can arise because of differences in depreciation methods, lives, first and last year conventions and salvage values. By contrast, a 'flow through' method of accounting for public utility property would exclude from its book (ratemaking) tax expense deferred taxes resulting from such differences. A conceptual discussion of accounting practices, contrasting traditional financial statement accounting (i.e., 'book' accounting), tax accounting and the accounting practices used by public utilities, follows in the final chapter of this study.

The Economic Recovery Tax Act of 1981 (ERTA) specifically excludes from the ACRS current purchases of fixed assets by an entity using the flow through method. Such entities are required to use the same method and useful life for tax purposes as is used for book (rate making) purposes.

- Units-of-Production Method of Depreciation

A taxpayer may elect to exclude property from the ACRS rules if the property is to be depreciated under the units-of-production method or any other method of depreciation not expressed in years. Depreciation methods related to use provide for depreciation charges proportionate to the length of service or production in relation to total projected service lives or projected unit output of the property.

This exception provides taxpayers with additional flexibility in selecting the most appropriate depreciation method. For example, for entities engaged in a manufacturing industry, the units of production method may be the best measure of the depletion of a particular asset's service life. Under this method, depreciation is calculated based on production output factored by the total estimated production capacity of the asset over its useful life.

Another depreciation method not directly associated with the mere passage of time is the service hour method, applied in a manner similar to the unit-of-production method but based on hours of operation.

- Property Subject to Amortization

A taxpayer may properly elect to amortize the cost of acquiring certain assets, such as leasehold improvements or Section 169 pollution control facilities. If the election to amortize either the entire cost or a portion thereof is made, then those costs subject to recovery through amortization must be excluded from the ACRS rules. The taxpayer may only recover the cost of such capital investments once. The topic of "Special Pollution Control Amortization" is discussed in more depth elsewhere in this chapter.

Determination of Asset Recovery Class

Under the ACRS rules, recovery property, whether new or used, is classified as one of five recovery classes. These five classes of recovery property are defined in terms of Section 1245 class property[2], Section 1250 class property[3], or the Asset Depreciation Range (ADR) class lives[4] of assets as of January 1, 1981.

As provided in Section 168, each item of recovery property shall be assigned to one of the following classes of property:

- 3-year property

  This recovery class is composed of Section 1245 class property with an ADR class life of four years or less, or used in connection with research and experimentation. Automobiles and light trucks are examples of property included in this class.

- 5-year property

  This recovery class is composed of all Section 1245 class property which is not 3-year property, 10-year property, or 15-year public utility property. Generally, this includes Section 1245 property with an ADR class life of more than four years. Most machinery and equipment and public utility property (other than Section 1250 property) with an ADR class life of 18 years or less would be included in this class. Pollution control equipment will often be classified as five year property.

- 10-year property

  This recovery class is composed primarily of Section 1250 class property with an ADR class life of 12.5 years or less and public utility property with an ADR class life of more than 18 but not more than 25 years (other than Section 1250 class property or 3-year property).

- 15-year real property

  This recovery class is composed of Section 1250 class property with an ADR class life of more than 12.5 years.

- 15-year public utility property

  This recovery class includes public utility property (other than Section 1250 class property or 3-year property) with an ADR class life of more than 25 years.

A summary of properties, relevant to this study, indicating ADR guideline lives may be found at Exhibit III. Once an asset is assigned to one of the recovery classes, calculation of the allowable depreciation is relatively mechanical.

First, the recovery basis of the asset acquired must be determined. With few exceptions, this will be the gross acquisition cost, which will include costs incurred in purchasing the property from an outside supplier or the capitalized cost of parts, labor, engineering, overhead and other items where the asset is self-constructed. Installation costs may also be included in the recovery basis of the asset in some situations.

Under ACRS, the asset basis thus determined is not reduced for salvage value, as is required under the Section 167 depreciation rules. Therefore the recovery basis will be the gross acquisition cost unless the taxpayer elects to treat a portion of such cost as amortizable under the special pollution control facility provision or elects to deduct a portion of the cost under the additional first year expense provision. In either case, the Section 168 recovery basis would be reduced by the costs treated separately under those other provisions. Both subjects are discussed in more depth later in this chapter.

Cost Recovery Deduction

The new ACRS has simplified depreciation for federal taxation purposes. Once the recovery basis has been determined and the asset has been assigned to the proper recovery class, the allowable annual ACRS deduction can be calculated by merely applying a statutory percentage to the recovery basis.

The statutory percentage is obtained from an ACRS table based on the property's class and the number of years since the property was placed in service (recovery year). The ACRS tables are included as Exhibit II.[5]

Election of a Different Recovery Percentage

As the previous discussion illustrates, computation of the ACRS allowable deduction is fairly mechanical once the recovery basis and the recovery class have been determined. However, there is an additional consideration. In order to provide the taxpayer with greater flexibility, the Section 168 ACRS rules allow the taxpayer to elect a different recovery percentage than that provided in the appropriate table. Specifically, Section 168(b)(3) provides that in lieu of the applicable percentage, "the taxpayer may elect, with respect to one or more classes of recovery property placed in service during the taxable year, the applicable percentage determined by use of the straight line method over the recovery period elected by the taxpayer in accordance with the following table:

In the case of:	The taxpayer may elect a recovery period of:
3-year property	3, 5, or 12 years
5-year property	5, 12 or 25 years
10-year property	10, 25, or 35 years
15-year real property.	15, 35, or 45 years
15-year public utility property. . . .	15, 35, or 45 years

The straight-line depreciation method provides for a constant depreciation charge over the life of the asset. Annual depreciation is determined by dividing the asset cost by the estimated recovery period. The depreciation rate is commonly expressed as a percentage to be applied periodically to asset cost.

The principal restriction on the exercise of this election is that for all classes except 15-year real property, the taxpayer may elect only a single percentage for property in any class of recovery

property placed in service during the taxable year. The percentage so elected shall apply to all property in such class placed in service during such taxable year and shall apply throughout the recovery period elected for such property. In addition, the half-year convention[6] must be used in calculating such cost recovery.

For 15-year real property a further exception has been made which election may be made on a property by property basis. In this instance, the half-year convention is not required and the cost recovery should be calculated based on the actual month the property was placed in service during the year. The following example will serve to illustrate the election of an optional recovery period.

> Assume the taxpayer has acquired various items of pollution control equipment in April 1982 at a total cost of $100,000, all of which fall within the 5-year property class. If the taxpayer applies the regular ACRS rate (Exhibit II), the recovery deduction in the first year would be 15% or $15,000. On the other hand, if the taxpayer wished to minimize the deduction, an optional recovery period of 5, 12 or 25 years could be elected, with the costs recovered using the straight line method. Assuming the 5-year optional recovery period were elected, the recovery deduction for the first year would be $10,000, computed as $100,000 (recovery basis) times 20% (5-year straight line recovery period) times 1/2 (half year convention). If the 12 or 25 year optional recovery period were selected, the depreciation expense would be further reduced.

It is important to note that if one of the optional recovery periods is elected for depreciating these assets, all other acquisitions of 5-year class recovery property must also be depreciated using the same straight line method over the same optional recovery period. However, this will not affect the treatment of acquisitions of any <u>other</u> class property. Similarly, acquisitions of 5-year class property in the following year or in prior years would likewise not be affected.

<u>Depreciation of Non-Recovery Property</u>

In all of the preceding discussions regarding ACRS rules, the asset acquisition was assumed to be Section 168 recovery property. However, it was previously pointed out that several types of

property are excluded from the Section 168 "recovery property" definition. Thus, where the property acquired falls within one of the excluded groups of property, the normal ACRS rules do not apply and depreciation must be calculated based on other rules.

In the case of public utility property which is not Section 168 recovery property due to the taxpayer's failure to use the normalization method of accounting, depreciation for tax purposes must be calculated by using a depreciation method which is the same as, and a depreciation period which is no shorter than, the method and period used to compute depreciation expense for purposes of establishing the public utility's cost of service for rate-making purposes and for reflecting operating results in its regulated books of account. Thus, the ARB analyst will be able to determine the allowable tax depreciation for such non-recovery property simply by ascertaining the method of depreciation used by the public utility in its regulated books.

In the case of property which is not recovery property because it is property not expressed in a term of years, whatever method the taxpayer elects, such as the units-of-production method discussed earlier, is the method the ARB analyst should use to calculate the allowable tax depreciation deduction.

In the case of property which is not recovery property because it is subject to amortization, such as leasehold improvements or Section 169 pollution control facilities, where the taxpayer has made an amortization election, the allowable deduction will be determined under the appropriate amortization provisions, as discussed later in this chapter.

Additional First Year Expense

For property placed in service before January 1, 1981, Internal Revenue Code Section 179 provided the taxpayer with the option of taking an additional first-year depreciation deduction on property placed in service during the year. This provision was identical to the California provision explained later in this chapter which provision continues to apply for California tax purposes.

The Economic Recovery Tax Act of 1981 amended Section 179, repealing the additional first-year depreciation deduction outlined above. In its place, a new Section 179 election to expense certain depreciable assets was provided.

Under the new provision, the taxpayer may elect to treat the cost of certain qualifying property, called Section 179 property, as an expense rather than as a capital expenditure. Section 179 property is defined as personal property that is recovery property and section 38 property and that is acquired by purchase for use in a trade or business (that is, property qualifying for the investment tax credit, as previously described in this chapter).

The costs for which the election is made are allowed as a deduction for the tax year in which the Section 179 property is placed in service and are in lieu of an ACRS deduction for these costs. Further, no investment tax credit is allowed for such costs.

The Section 179 election must be made as to the cost or a portion of the cost of specific items of property. In addition, there is an annual dollar limitation on the aggregate cost that may be expensed under this section as follows:

If the taxable year begins in:	The applicable amount is:
1981	$0
1982	$5,000
1983	$5,000
1984	$7,500
1985	$7,500
1986 or thereafter	$10,000

Note that the new Section 179 expense deduction is limited to a zero deduction in 1981. Thus, neither additional first-year depreciation nor expensing is allowed for property placed in service in tax years beginning in 1981.

Due to the limitation on the amount which may be expensed under this provision, this election will rarely have a material effect on the ARB analysis.

Amortization Of Leasehold Improvements

The ARB may mandate the installation of pollution control equipment to an entity which does not own its own plant, but rather leases its operating facilities from another. If the entity, as lessee, makes the required pollution control improvements to the leasehold, these are considered capital investments, not expenses, and are generally subject to cost recovery under the ACRS rules outlined previously.

However, where the remaining term of the lease is shorter than the ACRS recovery period for the property acquired, the lessee may make an election to opt out of the ACRS rules and, in lieu of cost recovery, amortize the cost of the improvements over the remaining term of the lease. This election would maximize the allowable annual deduction.

For the purposes of making this election, the ACRS recovery period takes into account any optional recovery period elected for this recovery class of property. Also, as a general rule, unless the lease has been renewed or the facts show with reasonable certainty that the lease will be renewed, no right of renewal is taken into account in determining the remaining term of the lease.

SPECIAL POLLUTION CONTROL AMORTIZATION

Overview

Internal Revenue Code Section 169 provides in part as follows:

> "Every person, at his election, shall be entitled to a deduction with respect to the amortization of the amortizable basis of any certified pollution control facility, based on a period of 60 months."

This Code Section, introduced into tax law as part of the Tax Reform Act of 1969, was adopted by Congress to stimulate greater investment in pollution abatement facilities through economic incentives. Congress intended to allow a more rapid write-off of

the costs incurred than could be achieved under the then existing depreciation rules, thus reducing the Company's actual effective after-tax cost of installing the equipment and encouraging private industry to cooperate with national efforts to reduce pollution.

In the past, taxpayers often achieved some benefit from the Section 169 amortization election, since the deduction allowed under Section 169 generally exceeded that allowed under Section 167 due to the relatively long life of pollution control facilities. However, the Section 168 ACRS deduction may decrease or remove the advantages of a Section 169 election. For example, where the pollution control facility would be classified as 5-year recovery property under ACRS, the taxpayer can achieve a more rapid write-off under the new Section 168 rules due to the accelerated recovery provided in the ACRS tables. Only where the property is 10-year or 15-year recovery class property does Section 169 amortization provide a more rapid recovery.

Due to the ERTA changes, and the fact that Section 169 amortization is elective, a company should give careful consideration to Sections 167, 168 and 169 to determine which apply and which will provide the greatest tax benefit.

Qualifying Property

In order for the Section 169 election to be available, the property acquired must qualify as a certified pollution control facility. This is defined in Section 169 as "a new identifiable treatment facility which is used, in connection with a plant or other property in operation before January 1, 1976, to abate or control water or atmospheric pollution or contamination by removing, altering, disposing, storing or preventing the creation or emission of pollutants, contaminants, wastes, or heat . . . " (emphasis added). In addition, the facility must be one which has been certified by both the state and federal certifying authorities and which does not significantly "increase the output or capacity, extend the useful life, or reduce the total operating costs of such plant or other property or alter the nature of the manufacturing or production process or facility."

As the above definition indicates, a wide range of property will qualify under Section 169. Basically, a new, identifiable treatment facility includes only tangible property depreciable under Sections 167 or 168, other than a building or its structural components (unless the building is exclusively a treatment facility). However, "used in connection with a plant or other property" is broadly interpreted to mean any tangible property whether or not such property is used in the trade or business or held for the production of income. Thus, the pollution control equipment could be used in connection with "property" ranging from a factory to a motor vehicle or a furnace in an apartment house.

To determine if a given investment in pollution control equipment qualifies, each of the following restrictions must be considered:

- Pollution Abatement

  The facility must abate and not diffuse pollution. Certain facilities required by pollution control authorities which only diffuse pollution, such as a required extension of a smokestack, do not qualify.

- Plant Betterment

  The property must not be a significant betterment to the overall plant if it is to qualify for Section 169 amortization. For this purpose, a betterment is defined as a property addition which:

  a. improves the overall plant's productive capacity, or

  b. extends the plant's useful life, or

  c. gives rise to additional revenues through the production or recapture of saleable bi-products.

  If a betterment occurs, it may be possible to allocate costs between the betterment and the non-betterment (or non-improvement) costs. To the extent that costs do not relate to a plant betterment, Section 169 amortization can apply.

- Multi-function Property

Properties which perform more than one function can qualify for amortization to the extent that the property is used for pollution control. Thus, total costs must be allocated to each function with only the portion attributable to pollution control qualifying for special amortization.

- Pre-1976 Plant

The purpose of the special amortization provision is to stimulate pollution control investment in older plants. The presumption is that relatively new plants should have been constructed with adequate pollution control capabilities. As such, in order for pollution control facilities to qualify, the existing plant on which the improvements are made must have been in operation before 1976. In addition, a pre-1976 plant may be disqualified if significant replacements or betterments have occurred since 1975. Post 1975 improvements that have generated an increase in capacity of over 20% are considered significant betterments and preclude qualification for special amortization. Also if a significant (over 20% cost basis) portion of the plant was replaced, due for example to fire damage, the plant is no longer considered a pre-1976 plant.

If both the acquired property and the existing plant qualify, the pollution control improvement can then be certified by state and federal authorities. Only then does the property qualify for special amortization tax treatment.

Amortization Deduction

Assuming the investment in pollution control equipment meets all the restrictions and qualifies under Section 169, and that Section 169 treatment is elected, the amortization deduction allowable for tax purposes must be calculated.

A company which chooses to use Section 169 amortization may elect to begin the 60-month amortization period with the month following the month in which the facility is completed or acquired, or with the first month of the taxable year succeeding the taxable

year in which the facility is completed or acquired. The election regarding the amortization start date provides the company with additional flexibility and will most often be predicated on its current tax position.

For taxpayers who defer the start of amortization until the following taxable year, ACRS is available in the initial year. In certain circumstances, the taxpayer may be able to recognize deductions more rapidly by taking ACRS in the initial year and then switching to 60-month amortization at the beginning of the next taxable year. If this were done, the resultant amortizable basis would be total cost less the amount taken as an ACRS deduction in the initial year.

The amortization allowed will be based on the total initial "amortizable basis" qualifying for Section 169 treatment. If the pollution control facility has a useful life of 15 years or less, such amortizable basis will be the total cost of the facility which meets the Section 169 requirements. If the facility has a life greater than 15 years, then only a portion of the cost will be amortizable. The percentage amortizable is the same percentage as 15 years is of the years of useful life. Thus, if the facility has a 20-year useful life, 75 percent (15/20) of the basis is amortizable.

> For example, if the facility has a useful life of 20 years and an adjusted basis of $200,000, then the Section 169 amortizable basis would be calculated as follows: $200,000 x 15/20 = $150,000. Thus, only $150,000 could be amortized under Section 169. However, the remaining $50,000 of adjusted basis could be recovered through depreciation or ACRS deductions in future years.

For purpose of this pollution control facility basis allocation, Regulation Section 1.169 - 2(a)(6) provides that the useful life to be compared to 15 years in making the allocation is "the shortest period authorized under Section 167 . . . if an election were not made under Section 169." Section 167 provides that since the passage of ERTA, the reasonable allowance for recovery property, which comprises most tangible depreciable property placed in service after 1980, will be the (ACRS) deduction allowable under Section 168.

The life to be used for most assets will therefore be the shortest period authorized under ACRS which does not, in any case, exceed 15 years. Thus, the amortization - basis allocation required for pollution control facilities seems to have been indirectly eliminated in most instances.

Note however that some property placed in service after 1980 is excluded from the ACRS coverage as previously discussed. In the rare instance where a pollution control facility falls within one of the Section 168 exceptions, the allocation of amortizable basis for property with a life greater than 15 years would still be required.

Once the amortizable basis has been determined, amortization is to be recognized on a straight line basis evenly over the 60-month period. In other words, 1/60 of the initial amortizable basis will be deductible for tax purposes each month. Such amortization deduction under this section for any month is in lieu of the depreciation deduction with respect to the pollution control facility provided by Section 168 or 167. However, the taxpayer is permitted to switch from the amortization deduction to the depreciation deduction by electing out of Section 169. Once the taxpayer elects out, amortization may not be resumed.

DEPRECIATION RECAPTURE

The gain on sale of property used in a trade or business generally qualifies for capital gains treatment. This gain is taxed to a corporate taxpayer at the lesser of its regularly computed tax or an alternative tax on capital gains. The alternative tax is 28% of the corporation's net long term capital gains. For individuals, estates and trusts, 60% of the net long term capital gain is exempt from taxation. However, depreciation previously taken on such assets may be subject to recapture, requiring the portion of the gain attributed to such depreciation to be taxed as ordinary income. Accordingly, depreciation recapture rules can impact federal income tax expense and should be considered in determining the actual after-tax cost of compliance with pollution control regulations.

Recapture rules relate to the acquisition of pollution control facilities in two possible applications:

1) The tax effects on dispositions of property replaced by newly acquired pollution control property, and

2) The future tax effects upon the ultimate disposition of pollution control facilities currently acquired.

The former is not a cost of installing new pollution control equipment, since any recapture is not directly related to such installation. The latter must be given some consideration since it may reduce the tax benefit achieved through depreciation of the equipment.

Overall, the impact of recapture should not be a significant factor in the ARB's analysis in most cases. Air pollution control equipment will not generally be sold, but rather will remain in service with the plant. If the property is disposed of, most often no gain will be realized. Assuming there is a gain, the disposition will usually be many years after acquisition and the effect of recapture in current dollars will be minimized. In light of this limited applicability, the recapture rules will be discussed only briefly.

The recapture rules are provided by Sections 1245 and 1250, which apply to depreciable personal property and depreciable realty. Generally, these sections provide that any gain on the disposition of such depreciable (or amortizable) property shall be treated as ordinary income to the extent of certain depreciation taken. For Section 1245 property, the gain on sale or disposition is taxed as ordinary income to the extent of <u>all</u> depreciation and/or amortization taken. Under the Section 168 ACRS rules, this applies to cost recovery for all property classes except 15-year real property. For non-residential Section 1250 depreciable realty, the gain on sale or disposition is taxed as ordinary income to the extent of all accelerated depreciation taken. Thus, under ACRS rules, this applies to cost recovery for all 15-year real property except straight-line recovery under one of the optimal recovery periods. In the case of non-ACRS only the excess of accelerated depreciation over straight-line is subject to recapture.

MINIMUM TAX

Overview

The tax benefits gained through accelerated methods of cost recovery, depreciation and amortization may be partially offset by the additional minimum tax imposed by Internal Revenue Code sections 55, 56, 57 and 58.

The minimum tax is imposed on certain tax preference items. For purposes of the ARB analysis, the relevant preference items are the accelerated portion of the deduction taken for depreciation or cost recovery on Section 1250 real property or Section 1245 property subject to a lease and the special amortization on certified pollution control facilities.

These tax preference items are calculated as follows:

(1) Accelerated depreciation on real property that is not recovery property. The excess of accelerated depreciation claimed over the straight-line depreciation that could have been claimed on each item of depreciable real property.

(2) Accelerated depreciation on leased personal property that is not recovery property. The excess of accelerated depreciation claimed over the straight-line depreciation that could have been claimed (under ADR, straight-line depreciation using the class life).

(3) Amortization. The excess of rapid amortization for each pollution control facility over the straight-line depreciation that could otherwise have been claimed for such facility or unit.

(4) Accelerated cost recovery deduction. With respect to personal recovery property subject to a lease and real recovery property, the excess of the ACRS allowance over the straight-line ACRS allowance using a 5-year recovery

period for 3-year property, an 8-year period for 5-year property, a 15-year period for 10-year property and 15-year real property, and a 22-year period for 15-year public utility property.

Ordinarily the taxpayer will not acquire pollution control equipment and then lease it out. Thus, the ARB analyst will rarely be concerned with accelerated depreciation on personal property (Section 1245) subject to a lease. However, the possible minimum tax exposure related to rapid amortization of a certified pollution control facility or accelerated depreciation on real property should be considered in determining the actual tax benefit derived from the use of these cost recovery methods.

Minimum Tax on Corporations

Corporations are subject to minimum taxation of up to 15% on their tax preference items. The tax is calculated based on the following formula:

Total Tax Preference Items	XXX
Less: The greater of	
1) Total federal income tax liability, before computation of mimimum tax, or	
2) $10,000	<XXX>
Subtotal: Amount subject to minimum tax	XXX
Multiply by: Minimum tax rate of 15%	.15
Total: Minimum tax	XXX

As is apparent from the above formulas, many factors are involved in the determination of the minimum tax. In order to properly assess the impact of the minimum tax on a given pollution control investment, information regarding the taxpayer's other tax preference items and the taxpayers income tax liability must be obtained.

ENERGY CREDITS

Business taxpayers can qualify for an energy tax credit of 10% for investments in qualified energy property made before 12/31/82. Alternative energy property is one relevant category of qualifying energy property. Pollution control equipment[7] required by federal, state or local regulations, to be installed on or in connection with the following equipment, will qualify as alternative energy property:

(1) a boiler the primary fuel for which will be an alternate substance[8],

(2) a burner (including necessary on-site equipment to bring the alternate substance to the burner) for a combustor other than a boiler if the primary fuel for such burner will be an alternate substance,

(3) equipment for converting an alternate substance into a synthetic liquid, gaseous, or solid fuel,

(4) equipment designed to modify existing equipment which uses oil or natural gas as a fuel or as feedstock so that such equipment will use either a substance other than oil and natural gas, or oil mixed with a substance other than oil and natural gas (where such other substance will provide not less than 25 percent of the fuel or feedstock), or

(5) equipment to convert -

(a) coal (including lignite), or any nonmarketable substance derived therefrom, into a substitute for a petroleum or natural gas derived feedstock for the manufacture of chemicals or other products, or

(b) coal (including lignite), or any substance derived therefrom, into methanol, ammonia, or a hydroprocessed coal liquid or solid.

However, note that the term "alternative energy property" does not include property which is public utility property.[1]

Although the credit is scheduled to expire at the end of 1982, it will be available after 1982 and before 1991 where certain tests are satisfied to show an affirmative commitment to acquire or construct qualifying energy property that involves long-term projects[9], such as large boiler and electrical generating systems and gasification and synthetic fuel plans. In such a case, the credit will be allowed for the tax basis attributable to construction or acquisition of property after 1982 and before 1991 if:

(1) all engineering studies on the project have been completed before 1983 and applications for all environmental and construction permits required under federal, state, or local law for the project have been filed before 1983, and

(2) binding contracts have been made before 1986 to acquire or construct at least 50 percent of all equipment (based on the equipment's cost as of December 31, 1985) that is specifically designed for the project.

Note that for the purposes of the energy credit, property can qualify even if it is considered a structural component. However, this does not affect the limitation imposed for the regular investment credit, and structural components of a building would still not qualify for the regular investment tax credit.

If energy property is also tangible personal property that qualifies for the regular investment tax credit, then <u>both</u> credits can be utilized.

To qualify for the energy credit, the equipment must be new, or, if acquired by the taxpayer, the original use must begin during the period specified above. In addition, the property must meet quality and performance standards that are in effect at the time of acquisition. These standards are to be prescribed in regulations to be issued by the Commissioner after consultation with the Secretary of Energy. However, if no standards are in effect at the time of acquisition, the property will not have to meet any later issued standards.

The credit is available only to persons engaged in a trade or business. If the property is disposed of before the end of the useful life claimed for purposes of the credit, the credit will be recaptured according to the rules for the regular investment credit. The property must have a useful life of at least three years or be recovery property.

Note that the recapture of the business energy credit will be based on the old recapture rules, not those used for calculating recapture on the disposition of the new Section 168 recovery property. In other words, the credit will be recalculated based on the years the property was actually held. This credit amount will then be subtracted from the credit actually taken, with the difference being the amount of the credit which must be recaptured.

INVESTMENT TAX CREDIT (ITC)

Overview

An important consideration in any analysis of the after-tax cost of an investment in air pollution control equipment mandated by the ARB is the effect of the investment tax credit.

The investment tax credit should be distinguished from a tax deduction. Tax deductions reduce taxable income upon which income taxes are assessed. Tax deductions provide only a fractional tax savings; dependent upon the marginal tax bracket of the taxpayer. The investment tax credit (ITC) like all tax credits, provides a dollar for dollar reduction of income taxes otherwise payable.

ITC is a federal tax concept and does not exist at the state tax level in California. Therefore, no credit against California franchise taxes payable is allowed for such investments in qualifying property.

In general, and absent the economic benefits obtainable through safe-harbor leasing (described later in this paper), the importance of ITC as it relates to pollution control costs is that, where the entity investing in pollution control equipment has a significant

federal income tax liability, the ITC serves to effectively reduce the actual cash cost of the equipment to that company by the amount of the credit allowed against the taxes otherwise payable.

For example, assume Alpha Corporation has profitable operations during 1982 and incurs a Federal income tax liability of $200,000 for the year. If Alpha is required to invest $100,000 in pollution abatement equipment during the same year, which we assume qualifies for the 10% investment tax credit, then Alpha will have a $10,000 credit with which it can reduce its federal income tax. Instead of paying $200,000 in tax, Alpha will pay only $190,000. Thus, the actual cost of equipment is only $90,000 (after ITC and before Federal and state tax benefits related to the recovery of the 100,000 cost), the $100,000 cost less the $10,000 tax savings.

To illustrate the difference between a tax deduction and a tax credit, contrast the cash benefit of this $10,000 investment tax credit with the cash benefit of a hypothetical depreciation deduction for this same equipment. Assuming that this property is five year ACRS property, it would qualify for a 15% first year depreciation deduction of $15,000. The cash benefit of this $15,000 deduction would be only $6,900 to a corporation paying taxes at a rate of 46% of taxable income (the maximum corporate rate).

Even in a year where the entity is not profitable, but has been in the past and/or will be in the future, the investment tax credit will be beneficial. The investment tax credit can be carried back to offset taxes paid in prior profitable years or carried forward to offset taxes payable in future profitable years.[10]

Qualifying Property

Property eligible for the investment tax credit, known as Section 38 property[11], must:

1. Be recovery property (ACRS) or property with respect to which depreciation (or amortization in lieu of depreciation) is allowable;

2. Be recovery property with a useful life (determined as of the time such property is placed in service) of three years or more. Note, the recovery period or useful life used in computing investment credit on a property generally must be the same as that used for depreciation or amortization purposes;

3. Be property placed in service during the year[12], and

4. Be one of the following:

   a. Tangible personal property (other than air conditioning or heating units), or

   b. Other tangible property (not including a building and its structural components) that is used as an integral part of manufacturing, production, or extraction, or as an integral part of transportation, communications, electrical energy, gas, water, or sewage disposal services.

In analyzing whether particular pollution control equipment purchases will qualify as Section 38 property, the nature of the investment must be determined. If the property is depreciable, which in most cases it will be, and has a life greater than three years, then you must decide whether it fits within one of the qualifying categories outlined in (4) above.

First, determine if the investment represents tangible personal property. If it does, it will qualify whether or not it is used as an integral part of an activity specified in 4(b). For purposes of this determination, tangible personal property is defined in Regulation Section 1.48-1(b)(2) as any tangible property except land and improvements thereto, such as buildings or other inherently permanent structures and items which are structural components thereof. Tangible personal property includes all property (other than structural components) which is contained in or attached to a building. Further, all property which is in the nature of machinery, other than structural components of a building or other inherently permanent structure, is considered to be tangible personal property even though located outside the building.

In most cases, pollution control equipment will qualify as tangible personal property, either as machinery and equipment or as a nonstructural component attached to a building.

However, if the pollution control equipment does not qualify as tangible personal property, it may qualify as other tangible property used as an integral part of manufacturing, production, etc.

Property is used as an integral part of one of the specified activities if it is used directly in the activity and is essential to the completeness of the activity.[13]

Several definitions provided by the Regulations are useful in determining whether a particular investment qualifies as Section 38 property. In particular, since buildings and structural components thereof do not qualify, the Regulations provide the following definition of these terms.

The term "building" means any structure enclosing a space within its walls and usually covered by a roof, the purpose of which is, for example, to provide shelter or housing or working office, parking, display, or sales space. This term includes any such structure constructed by, or for, a lessee even if such structure must be removed, or ownership of such structure reverts to the lessor at the termination of the lease. However, this term does not include a structure which is essentially an item of machinery or equipment. Also this term does not include a structure which houses property used as an integral part of one of the specified activities if the use of the structure is so closely related to the use of such property that the structure clearly can be expected to be replaced when the property it initially houses is replaced. Factors which indicate that a structure is closely related to the use of the property it houses include the fact that the structure is specifically designed to provide for the stress and other demands of such property and the fact that the structure could not be economically used for other purposes.

The term "structural components" includes such parts of a building as walls, partitions, floors, and ceilings, as well as any permanent coverings such as paneling or tiling. In general, a permanency test has been applied in determining whether assets attached to a structure are components of the building or are tangible personal property. The less permanent an item is, the more likely it is to qualify for the investment credit.

Determining the Amount of the Investment Tax Credit

Once the property eligible for the regular 10% investment tax credit has been determined, as discussed above, the ARB analyst must ascertain the qualified investment in such property to which the credit should be applied.

In general, the qualified investment is calculated by applying a statutory percentage to the basis[14] of eligible new[15] property and the cost of eligible used property acquired during the year. However, the cost of eligible used property which may be considered is limited to a maximum of $125,000 ($150,000 for years beginning after 1984). No such limitation is imposed for eligible new property acquisitions.

The statutory percentage to be applied to the eligible property varies based on several factors. Therefore, the easiest way to determine the qualified investment is to divide the eligible property into three separate categories:

- ACRS recovery property (Section 168)
- Property depreciated under Section 167
- Certified pollution control facilities amortized under Section 169

- ACRS recovery property. The investment credit rate is applied to qualified investment in property placed in service after 1980 determined on the basis of the ACRS recovery period rather than by the useful life of the asset. For eligible 15 year public utility, 10 year, or 5 year property, 100% of the investment qualifies for the regular 10% investment credit. For three year recovery property, only 60% of the investment qualifies for the 10% credit (therefore "effectively" a 6% credit).

- Non-ACRS recovery property which is subject to depreciation under Section 167. The estimated useful life of the property at the time it is placed in service by the taxpayer determines the percentage of the eligible

property which is considered to be a qualified investment. For eligible property with a useful life of at least three but less than five years, 33-1/3% qualifies; for eligible property with a useful life of at least five but less than seven years, 66-2/3% qualifies and for eligible property with a useful life of seven years or more, 100% of the investment qualifies for the 10% credit.

- Certified pollution control facilities amortized under Section 169. The estimated useful life of the property at the time it is placed in service by the taxpayer again determines the percentage of the eligible property which is considered a qualified investment. For eligible property with a useful life of less than five years, 33-1/3% qualifies. For eligible property with a useful life of five years or more, 100% of the investment qualifies for the credit.[16]

See Exhibit I, for a summarization of these guidelines.

As indicated above, the regular 10% investment tax credit is applied to the resulting qualified investment in all cases.

Qualified Progress Expenditures

In addition to the qualifying Section 38 property acquired and placed in service during the year, the taxpayer may elect to treat certain qualified progress expenditures as qualifying property for investment tax credit purposes. This election, subject to the requirements of Internal Revenue Code Section 46(d), provides the taxpayer with an opportunity to gain the benefit of the investment tax credit currently, even though the property will not be placed in service until a later year.

The major requirement imposed by Section 46(d) is that the progress expenditures be for "progress expenditure property." In general, "progress expenditure property" means any property which is being constructed by or for the taxpayer[17] and which:

1. has a normal construction period[18] of two years or more, and

2. it is reasonable to believe will be new Section 38 property in the hands of the taxpayer when it is placed in service.

These requirements are to be satisfied on the basis of facts known at the close of the taxable year in which construction begins (or, if later, at the close of the first taxable year to which the progress expenditure election applies).

Assuming these requirements are met, the taxpayer will be able to treat the expenditures as qualifying property for investment tax credit purposes. The amount of the credit on such progress expenditure property will then be calculated based on the general investment credit rules previously outlined, depending on the type of property under construction. If the property will be Section 168 recovery property, the applicable investment tax credit will be determined under the general rules for such property based on a reasonable expectation of what recovery class of property it will be when it is placed in service. If the property will be nonrecovery property, the applicable percentage will be determined based on a reasonable expectation of what the useful life of the property will be when it is placed in service. Finally, if it is expected to be a section 169 pollution control facility, those rules will apply.

Maximum Investment Credit

Notwithstanding the amount of the regular investment credit calculated, the credit allowed by IRC Section 38 for the taxable year is limited to the current year tax liability up to $25,000, plus 90% of the tax liability for the year in excess of $25,000.

For example, assume the taxpayer's acquisitions during the year generate $100,000 of investment tax credit and that a $10,000 federal tax liability otherwise payable is evident due to income from operations. The credit allowed for the current year would be $92,500, calculated as $25,000 plus 90% of the $75,000 excess tax liability ($100,000 - $25,000). The remaining unused credit of $7,500 would be available for carryback or carryover to offset taxes in other

years. The $7,500 tax liability for the current year not offset by ITC would therefore remain payable by the taxpayer.

Investment Credit Recapture

Internal Revenue Code Section 47 provides for the recapture of all or part of the investment credit as additional tax if the taxpayer prematurely disposes[19] of the investment credit property or employs it in a disqualifying use.[20] The ARB analyst should consider this potential recapture tax since it may significantly reduce the benefit of any investment tax credit allowed during the year of acquisition.

The recapture tax amount depends on the number of years the property is held and whether the property is recovery or non-recovery property. If the property disposed of is recovery property on which ITC was taken, the amount of the recapture is a percentage of the original credit claimed, depending on how long the property is held as follows:

If the recovery property ceases to be section 38 property within:	The recapture percentage is: For 15-year, 10-year, and 5-year property	For 3-year property
1. One full year after placed in service	100	100
2. One full year after the close of the period described in clause (1)	80	66
3. One full year after the close of the period described in clause (2)	60	33
4. One full year after the close of the period described in clause (3)	40	0
5. One full year after the close of the period described in clause (4)	20	0

If the property disposed of is non-recovery property on which ITC was taken, the amount of the recapture is again a percentage of the original credit claimed as follows:

If the non-recovery property is held as Section 38 property for:	Estimated useful lives and relevant recapture percentages:		
	3-5 years	5-7 years	7 years or more
1. Less than three full years after placed in service	100	100	100
2. At least three years but less than five	0	50	66
3. At least five years but less than seven	0	0	33

The nature of the recapture tax makes it difficult for an ARB analyst to include it in calculating the after-tax cost of a pollution control investment. No one can forsee the premature disposal of assets at the time they are acquired. However, if the estimated useful life of the asset placed in service is less than the recovery class life assigned to it for determining ITC, then the exposure to recapture should be apparent.

For example, if the ARB analyst is aware that a certain item of pollution control equipment will normally be replaced in three years, yet finds that it is five-year recovery class property for ITC purposes, it is likely the taxpayer will be subject to recapture in the fourth year. Therefore, in calculating the tax benefit resulting from ITC in the year of acquisition, the ARB analyst should consider reducing the benefit by the potential recapture.

CALIFORNIA TAX MATTERS

Overview

In analyzing the actual cost of an investment in pollution control equipment, the impact of California tax laws is an important consideration. The rate of franchise tax for the calendar years

1980, 1981, and 1982 is 9.6%. The rate for 1983 will be in the range of 9.3% to 9.6% determined by a formula based upon prior years' tax collections.

The tax is imposed upon corporations organized in California and upon out-of-state (foreign) corporations which are doing business in the state. If a corporation derives income from both within and without California a portion of this total income is allocated to California and taxed at the rates indicated above.

This taxable income apportionment concept is really not relevant to the ARB analyst's determination of the tax impact of an investment in pollution control equipment in California. The focus of such an analysis will revolve around the tax benefit of such an investment, through depreciation, etc., calculated at a rate equal to 9.6% of the tax deductions related thereto.

California tax law is patterned generally on the Federal income tax. However, there are many differences between the two laws which are relevant to this study.

Investment Tax Credit

California has no provision similar to Section 38 of the Internal Revenue Code and no investment credit against California franchise taxes payable is allowed for an investment in pollution control equipment.

Depreciation

Prior to passage of the Economic Recovery Tax Act of 1981 (ERTA), which extensively revised the federal depreciation rules, the California rules for depreciation were essentially the same as those provided by federal IRC Section 167. After the Act, however, which is controlling for asset acquisitions after December 31, 1980, the depreciation for California purposes may in many cases differ significantly from that determined for federal purposes.

The Federal rules, as previously discussed, now provide for depreciation or cost recovery under Sections 167 and 168. In general, all qualifying property acquired after 1980 is subject to the new accelerated cost recovery system provided by IRC Section 168 unless:

1. The property is public utility property and the taxpayer does not use a normalization method of accounting, or

2. The taxpayer elects to exclude such property from the application of this section and the property is properly depreciated under the units-of-production method or any method of depreciation not expressed in a term of years.

Only where the property falls within one of these exceptions is it excluded from (ACRS) Section 168. If it falls within exception 1, it is depreciated using the same method that is used for the regulated books of account. If it falls within exception 2 it is depreciated under whatever method (not expressed in a term of years) has been selected. Since California depreciation rules closely parallel the old Federal Section 167 rules, it is only in these later two situations that the federal and California depreciation may be the same. In all other cases, the federal Section 168 accelerated cost recovery deduction will differ from the California depreciation.

Under existing California law there is allowed as a depreciation deduction, "...a reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence) of property used in the trade or business, or of property held for the production of income."

There will generally be no difference in property which will qualify for the deduction under federal and California rules. If the investment is determined to be Section 168 recovery property subject to the cost recovery system or Section 167 depreciable property for federal purposes, it will be subject to an allowance for depreciation for California purposes.

Any federal and California differences in the deduction allowable will generally relate to the <u>life</u> over which the cost of the property will be recovered and the <u>method</u> used to determine the amount recoverable each year.

As previously discussed, the newly enacted federal cost recovery system provides for pre-determined recovery lives based on the type of property acquired. Once it is determined which category the property falls within, a set percentage is applied to the cost of the property to determine the annual deduction for depreciation. As an alternative, an optional life may be selected over which an equal annual deduction may be taken (optional straight-line recovery).

In California, the term "reasonable allowance" is defined by the regulations to include the following depreciation methods:

1. The straight line method;
2. The declining balance method, using a rate not exceeding twice the rate which would have been used had the annual allowance been computed under the straight line method;
3. The sum of the year-digits method; and
4. Any other consistent method productive of an annual allowance which, when added to all allowances on the property for prior periods, doesn't exceed the maximum allowance which would have been allowed under the declining balance method.

Methods 2 through 4, although generally allowable, may only be used where the property has a useful life of three years or more and are subject to certain limitations based on the type of property acquired. If the property acquired is new Section 18211 property (as defined below), there are no limitations. If the acquisition is used Section 18211 property or new commercial or industrial real property (Section 18212 property), then the maximum allowance under these methods is 1.5 times the allowable straight line deduction. Finally, if the property acquired is used commercial or industrial real property (Section 18212) methods 2 through 4 may not be used. The depreciation allowable on such property may only be computed using the straight line method.

For purposes of applying the above limitations, Section 18211 property is the equivalent of Federal Section 1245 property and is generally defined as personal property, or other tangible property (not inlcuding a building or its structural components) used as an integral part of manufacturing, production, or extraction or of furnishing transportation, communications, electrical energy, gas, water, or sewage disposal services. This definition is identical to that found in the federal section on property qualifying for investment tax credit and should be interpreted similarly.

Based on the above statutory provisions, an ARB analyst will be able to assess the type of property acquired and determine the maximum allowable California depreciation. However, it should be noted that other factors may influence a company's decision regarding which California depreciation method to use and in some cases, the maximum depreciation allowable may not be taken. For example, a company with significant losses from operations in a given year may choose the straight line method for assets acquired during the year to minimize depreciation expense, thereby minimizing its overall loss. This can be an important consideration in California, since no carryover or carryback of net operating losses in permitted for California franchise tax purposes.

Class Life Asset Depreciation Range System (ADR)

Under current California law, as under the Federal Section 167 depreciation rules, a taxpayer may elect to compute depreciation under the Class Life Asset Depreciation Range System (ADR). ADR provides class lives for various asset categories based on broad industry classifications outlined in Rev. Proc. 77-10.

For the ARB analyst, the ADR system is merely another consideration in determining the tax benefit a given taxpayer will receive due to the depreciation expense generated by an investment in pollution control equipment. At the Federal level, the use of ADR will be quite rare, since most assets acquired after 1980 will be subject to the Section 168 cost recovery system rules. Only

where the equipment is excluded from those rules, and is subject to depreciation under Section 167, will the taxpayer be able to elect the ADR system for Federal purposes. Even then, however, rapidly amortized properties, such as Section 169 pollution control facilities, are not eligible for ADR depreciation, thus further limiting its application.

For California purposes, the ADR election will generally be available to the taxpayer. However, it will still be the unusual case where this election is made, at least partly due to the extensive rules related to its use.

The ADR system, for both Federal and California purposes, applies to all Federal Section 1245 and 1250 property. However, presently there are no class lives for buildings (other than farm buildings). Therefore, for purposes of the ARB analysis, only Section 1245 asset acquisitions need be considered in this context.

If ADR is elected, a taxpayer must use the straight-line, the sum of the year's digits or the double declining balance method of depreciation for new eligible property. In the case of used eligible assets acquired during the year, the straight-line or the 150% declining balance method must be employed.

The major drawback to making the ADR election is that if it is made for any year, the election covers all eligible property first placed in service in that year by the taxpayer. This applies regardless of whether the assets are used in a trade or business or held for the production of income. Thus, the election may not be made for all the eligible assets put into operation in one trade or business for a year without making the election for those placed in service in any other trade or business of the same taxpayer.

In computing ADR depreciation, the taxpayer must use one of two first-year conventions. The half-year convention requires a half-year's depreciation be taken on all assets placed in service during the first year. The assumption made is that property is placed in service on the first day of the second half of the tax year. The modified half-year convention requires a full year's

depreciation on first-half additions in the year first placed in service. Second-half of the year additions are allowed no depreciation in the year they are placed in service. On retirement, the final year's depreciation allowed is adjusted based on whether the asset was a first or second half addition when acquired.

The only major difference in the ADR rules for Federal and California purposes is that under the Federal system, the taxpayer is provided with a range of years that is about 20% above and below the class life. Thus, if the class life for the particular asset class is 10 years, the taxpayer may elect a life from within the range of 8 to 12 years. For California, there is no range and the taxpayer must use the assigned class life of 10 years. Refer to Exhibit III for a summary of relevant ADR property and guideline lives.

Additional First-Year Depreciation Allowance

California Revenue and Taxation Code Section 17213 provides that the reasonable allowance for depreciation under Section 17208 (previously discussed) may, at the election of the taxpayer, include an additional allowance of 20 percent of the cost of the property acquired for the first taxable year a depreciation deduction is allowable. However, this additional deduction is limited to a maximum of $2,000, since the election may only be made as to qualifying property with an aggregate cost of $10,000. Qualifying property for this purpose includes only tangible personal property which is otherwise depreciable, with a useful life of at least six years from acquisition.

Note that this California additional first-year depreciation allowance is different from the Federal additional first-year expense discussed previously. The California allowance is calculated as 20% of the first $10,000 of qualifying property additions during the year, whereas the Federal expense is calculated as a flat dollar amount (limited to $5,000). In either case, however, the basis of the property for regular depreciation or cost recovery is reduced by the additional first year deduction. Thus, if a corporation acquires $20,000 of

qualifying property in 1983, the taxpayer may elect an additional first-year Federal expense of $5,000 and California additional first-year depreciation of $2,000. Regular depreciation or cost recovery would then be calculated on the remaining basis of $15,000 for Federal purposes and $18,000 for California purposes.

Amortization of Pollution Control Facilities

California Revenue and Taxation Code Section 17226, in providing for the accelerated write-off of certified pollution control facilities, generally conforms to the previously discussed Federal rules outlined in Internal Revenue Code Section 169. The taxpayer, then, may make an election to amortize the basis of any certified pollution control facility *in lieu of* the depreciation deduction with respect to such property provided by Section 17208. However, the following Federal/California differences should be noted.

1. For pollution control facilities located in California, Section 17226 will allow the taxpayer an optional (and irrevocable) election to use a twelve month amortization period in lieu of a sixty month period. For facilities located outside the state, California conforms with the Federal provision allowing only a sixty month amortization election.

2. The Federal law requires certification both by a state agency and by a federal certifying authority, while California requires certification only by the State Department of Health Services.

3. The Federal law applies only to facilities installed in plants in operation before 1976, while California does not have this limitation.

4. The California law applies only to facilities placed in service before January 1, 1988, while Federal law does not provide for this termination date.

As with the Federal provisions, California allows the taxpayer to elect to begin the amortization period either with the month or with the taxable year following completion or acquisition of the facility, and to elect to discontinue amortization at any time upon giving timely notice. However, this applies only to the 60 month election. The optional 12 month election is irrevocable and such amortization may not be discontinued.

These elections give the taxpayer some flexibility in maximizing the utilization of the amortization deduction and must be considered by the ARB analyst in analyzing the actual benefit the taxpayer will receive.

ILLUSTRATIONS

EXAMPLE 1

Facts

Assume that during 1983 manufacturer ABC corporation is required to install baghouse facilities for the abatement of particulate matter emitted from its furnaces into the atmosphere. Further, assume this air pollution control facility includes the following components listed in order of process flow of particulate matter from each of the furnaces:

1. The ducting from the furnace which includes plenum chambers.
2. A series of heat exchangers to cool the gases from 1000°F to 250°F before entering the collector bags.
3. Two centrifugal collectors to remove large particles.
4. Two 900-1250 HP fans to convey gases through the collectors.
5. The modular design baghouse which includes:
    a. Three modules - one on top of each other - with filter bags.
    b. Hoppers - two sections, an upper and a lower.
    c. Shaker mechanism.
    d. Damper valves.
    e. Conveyer system to remove particulate matter.
6. Electrical power equipment - transformers, motor starters, sensing and control equipment. These collector systems automatically regulate themselves by sensing and reacting to current, pressure and temperature.

The entire facility is field assembled on structural steel supports which are bolted to concrete piers. During the operation of the facility the anchor bolts maintain alignment and keep the entire facility on its foundation.

Each one of the baghouse compartments contains numerous filter bags. Each compartment sits on four support columns. The trusses are standardized and shop-assembled, ready to be lifted into place.

Each compartment housing is broken up into three modules which are resting on top of each other. Each module is completely finished in the shop. Walkways on the upper section are welded to the module. All modules are individually sided with corrugated siding. The finished modules are then shipped to the erection site and lifted into place like big building blocks. No bolting is required. All that is required is tackwelds at the four corners to keep the modules from shifting during the erection.

The baghouse facility is, by its nature, very large. It is located as close to the furnace as economics and space availability permit. An assumption has been made for purposes of this example that the cost of this entire example facility amounts to $1 million.

Depreciation

From the above description of the baghouse facility, it is apparent that it comprises tangible property used in the company's business and, since acquired after 1980 will be subject to cost recovery under the ACRS rules.

Under the ACRS, the analyst should first determine if one of the exceptions applies. Here, none would apply. The taxpayer is not a public utility. In addition, we may assume that the taxpayer owns its plant and is therefore not able to elect amortization of the assets as leasehold improvements. Finally, we may assume the company will not use a depreciation method not expressed in a term of years. Since none of the exceptions apply, cost recovery will be calculated based on the appropriate percentage provided for the applicable asset recovery class.

To determine the proper asset recovery class, the analyst must ascertain whether the property acquired is Section 1245 or Section 1250 property. Here, all of the mechanical components would appear to represent tangible depreciable personal property classified as

Section 1245 property. Since such components would typically have an ADR class life greater than four years, they would be treated as five-year recovery class property.

The baghouse facility structure, including the concrete piers, the structural steel supports, the trusses, the walkways and the modules and hoppers, is more difficult to categorize. Although arguably not tangible personal property, such items should qualify as Section 1245 property as other property (not including a building or its structural components) used as an integral part of manufacturing. Here, the facts indicate the baghouse facility is more like a piece of equipment than a separate structure, with the company apparently able to move the facility to a new plant if necessary. Based on this assessment, these components would also be treated as five-year recovery class property.

Once it is determined that the property acquired is all five-year recovery class property, the maximum allowable deduction for each year can be determined by applying the percentage provided in the ACRS table to the total cost. Assuming the company intends to maximize its deductions, the following table would illustrate the allowable annual deductions and benefits:

Year	ACRS Rates (Per Exhibit II)	Allowable Deduction	Effective Rate Tax	Tax Benefit
1	15%	$ 150,000	46%	$ 69,000
2	22	220,000	46%	101,200
3	21	210,000	46%	96,600
4	21	210,000	46%	96,600
5	21	210,000	46%	96,600
	100%	$1,000,000		$460,000

However, the analyst should consider the company's tax situation and may want to contact the company before assuming the maximum deduction will be taken. Optional recovery periods are available and may be used, if the taxpayer determines they would provide greater tax benefit.

Pollution Control Facility Amortization

Although the baghouse facility would probably qualify for special amortization, it would possibly provide no additional benefit to the taxpayer in this case, since the property already qualifies for cost recovery over a five-year period - at an accelerated rate, or on a straight-line basis if the optimal recovery period is elected.

Investment Tax Credit

In addition to the tax benefit derived from the depreciation deduction, the Company will receive tax benefit from the investment tax credit, assuming the baghouse facility qualifies as Section 38 property.

IRC Section 48(a)(1) provides that the term "Section 38 property" means tangible personal property or other tangible property (not including a building or its structural components), but only if such other property is used as an integral part of certain specified activities including manufacturing.

Section 1.48 - 1(a) of the Income Tax Regulations defines Section 38 property as property

1. with respect to which depreciation (or amortization in lieu of depreciation) is allowable,
2. which has an estimated useful life of three years or more, and
3. which is either:
    a. tangible personal property, or
    b. other tangible property (as defined above).

In this case, it has already been determined that the property is depreciable and has an estimated useful life greater than three years. Therefore, only requirement 3 remains to be satisfied. Note that this requirement is similar to one already addressed in determining the baghouse qualified as Section 1245 property for depreciation purposes.

Keeping in mind that tangible personal property is not intended to be defined narrowly (Senate Report No. 1881, 87th Cong., 2d. Sess. (1962)), it is not difficult to consider the baghouse as tangible personal property in the nature of machinery and equipment.

The baghouse facility is not a building as defined in Section 1.48 - 1(e)(1) of the regulations since it does not provide shelter, housing, work, office, or sales space. Nor is the baghouse facility a structural component of a building as defined in Section 1.48 - (1)(e)(2). The purpose of the system is to collect emissions from the furnace and not to act as a ventilation system for the furnace building.

There is little doubt that some major components of the baghouse system qualify as property that is in the nature of machinery. These major components include Item 2 (the heat exchangers), Item 3 (the pre-cleaners), and Item 4 (the fans). The other components upon which there could be any doubt as being in the nature of machinery are Item 5 (the modular-design baghouse), Item 1 (the ducting from the furnaces) and Item 6 (the electrical power equipment). These components are passive in nature except for the fact that the baghouse does contain mechanisms in the form of shakers, dampers and conveyors.

However, even these components may be considered in the nature of machinery. The ducting and plenum chambers may be considered supportive to the rest of the machinery and equipment since they collect the exhaust gases from the furnaces and conduct them through the components to the filter bags. Similarly, the electrical power equipment supports all of the machinery items.

Further, the baghouse unit contains the many filter bags (equipment) that ultimately collect the particulates. Through the automatic shaker mechanisms the collected particulates are dropped to the hopper sections, and by use of the conveyor system particles are ultimately disposed of.

The baghouse is modular in design and is put together building block style by tackwelding. The modules may be removed without much difficulty, and the company may relocate some of the modules from one site to another. Similarly, the hoper sections are modular in design. Therefore, the baghouse modules and hoppers can be considered personal, since they follow the provisions of Rev. Rul. 75-178 (the classification of property, as personal or inherently permanent, is made on the basis of attachment to the land or structure and on how permanently it is designed to stay in place) and are not designed to remain in place permanently.

Based on this analysis, it may be concluded that the entire facility, including the concrete pillars and the facility substructure, will qualify for investment tax credit. Thus, 10% of the cost of the baghouse facility, or $100,000, may be taken as a credit in the year of acquisition (year 1) to reduce federal income taxes otherwise payable.

Energy Credit

The baghouse facility will not qualify as alternative energy property since it is not installed on, or in connection with, a boiler, burner, or equipment for conversion to an alternate substance.

In addition, although heat exchangers will often qualify for the energy credit as specially defined energy property, they will only qualify if their principal purpose is reducing the amount of energy consumed in any existing industrial or commercial process and they are installed in connection with an existing industrial or commercial facility. Here these requirements are not met and no energy credit is available.

California Tax Matters

Investment Tax Credit

No investment tax credit is allowed for California tax purposes.

Depreciation

Since the ACRS rules apply only for federal tax purposes, the baghouse facility would be subject to the normal depreciation rules for California tax purposes.

To calculate the maximum allowable depreciation, the useful life of the property must first be determined. The ARB analyst may consult the ADR tables (Exhibit III) for guidance but may also take other factors into consideration in establishing the estimated useful life. This life will often differ significantly from the federal ACRS recovery period.

In our case, the estimated useful life of the baghouse components may be closer to 10 years, rather than the five-year ACRS recovery period life. ARB engineers may be able to provide additional input in determining how long the facility and its components will be useful.

Assuming the life of the baghouse is determined to be 10 years, the maximum depreciation deduction available to the taxpayer would be computed using the declining balance method at twice the straight-line method over the ten-year term. The following table identifies the benefit of this depreciation allowable for California tax purposes.

Year	Double-Declining Balance Depreciation Rate	Net Book Value Of Investment	Allowable Depreciation Deduction	Effective California Tax Rate	Benefit of California Depreciation
beginning		$1,000,000			
1	20	$ 800,000	$200,000	9.6%	$19,200
2	20	$ 640,000	$160,000	9.6%	$15,360
3	20	$ 512,000	$128,000	9.6%	$12,288
4	20	$ 409,600	$102,400	9.6%	$ 9,830
5	20	$ 327,680	$ 81,920	9.6%	$ 7,864
6	20	$ 262,144	$ 65,536	9.6%	$ 6,291
7	20	$ 209,715	$ 52,429	9.6%	$ 5,033
8	20	$ 167,772	$ 41,943	9.6%	$ 4,026
9	20	$ 134,218	$ 33,554	9.6%	$ 3,221
10	20	$ 107,375	$ 26,843	9.6%	$ 2,577

The California effective corporate tax rate is 9.6% in 1982 and is currently statutorily projected to be 9.3% to 9.6% in years 1983 and beyond; and will be determined through the use of a formula based upon prior years state of California tax collections. Again, if the taxpayer is not in a situation where maximizing the depreciation deduction provides the greatest tax benefit, a different method of depreciation may be elected.

No additional analysis is required to ascertain that the baghouse is depreciable property, since property which qualifies as depreciable property for federal purposes will also be depreciable for California tax purposes.

Amortization of Certified Pollution Control Facilities

Unlike the federal tax situation, where the special amortization of the cost of the facility over 60 months would not provide any additional tax benefit, for California purposes the special amortization election may maximize the taxpayers deduction. Assuming the life of the baghouse is approximately 10 years, straight-line amortization over a five-year period will exceed the maximum deduction which could be achieved by depreciating the property over its 10-year life, no matter which accelerated depreciation method was used. Assuming that the facility was put in place on January 1, 19XX, the following table would illustrate the effect of this 60 month amortization:

Year	Five Year Straight Line Amortization %	Annual Ammortization	Assumed California Effective Tax Rate	Effective Annual Benefit
1	20	$ 200,000	9.6%	$ 19,200
2	20	$ 200,000	9.6%	$ 19,200
3	20	$ 200,000	9.6%	$ 19,200
4	20	$ 200,000	9.6%	$ 19,200
5	20	$ 200,000	9.6%	$ 19,200

Note also that the California tax provisions will allow the taxpayer an optional election to use a twelve-month amortization period in lieu of the sixty-month period, provided the baghouse

facility is located in California. Amortization over a twelve-month period would significantly accelerate recovery of the Company's costs. This method would only be elected if the company had a large amount of taxable income currently so that the amortization deduction would offset some of this income and provide an immediate tax benefit.

The availability of the special amortization elections presumes the baghouse facility qualifies for certification by California as a certified pollution control facility. Although the requirements for such certification vary on a county-by-county basis, an integrated system of particulate emission abatement such as this baghouse facility would generally qualify.

EXAMPLE 2:

This example centers around a typical retail service station subject to the Air Resources Board mandated vapor recovery control measures. To comply, the service station installs underground piping from the underground storage area to the pumps, new hoses and nozzles, a blower and a burner on the roof of the station, all at a cost of $15,000 (equipment installation costs are capitalized and included in the amount of $15,000).

Assuming the service station is a profitable operation, the owners will probably choose to minimize federal and California income taxes by maximizing the deductions and credits generated by this investment in pollution control equipment.

Under the new ACRS rules, all the equipment would be Section 1245 tangible personal property and would be classified as five-year recovery property, assuming it has an ADR class life greater than four years.

As depreciable tangible personal property with a life of more than three years, the equipment would qualify for federal investment tax credit (ITC). A credit of $1,500 ($15,000 x 10%), against Federal taxes otherwise payable, would be available, with recapture only if the property is disposed of within five years. The ARB analyst can determine the likelihood of premature disposition, and should consider this in valuing the tax benefit created by the ITC.

As five-year recovery property, the equipment would provide federal depreciation of $2,250 in the first year ($15,000 x 15%). The size of the depreciation tax benefit will depend on the tax bracket of the taxpayer. If the taxpayer is in the 46% bracket, then the first year $2,250 depreciation deduction will provide $1,035 of effective cash tax benefit year. The investment tax credit of $1,500 will provide a $1,500 effective, dollar-for-dollar, tax benefit assuming the taxpayer has taxes in excess of this amount otherwise payable.

No investment tax credit is allowed for California tax purposes. Since the ACRS rules apply for federal tax purposes, the equipment would be subject to the normal depreciation rules for California tax purposes.

To calculate the maximum allowable depreciation, the useful life of the property must first be determined. The ARB analyst may consult the ADR tables (Exhibit III) for guidance but may also take other factors into consideration in establishing the estimated useful life. This life will often differ significantly from the federal ACRS recovery period.

The estimated useful life of the equipment may be closer to 10 years, rather than the five-year ACRS recovery period life. The maximum depreciation deduction available to the taxpayer would be computed using the declining balance method at twice the straight-line method over the ten-year term. Again, if the taxpayer is not in a situation where maximizing the depreciation deduction provides the greatest tax benefit, a different method of depreciation may be elected.

The following summarizes the effect of the tax considerations regarding this $15,000 investment in equipment.

ACRS Year	Balance (DDB) Depreciation	"California Purposes" Double Declining Depreciation
1	$ 2,250	$ 3,000
2	3,300	2,400
3	3,150	1,920
4	3,150	1,536
5	3,150	1,229
6	-	983
7	-	737
8	-	540
9	-	393
10	-	285

Summary of Effective Tax Benefits

Year	Investment Tax Credit	Benefit of "Federal Depreciation (at a 46% marginal tax rate)	Benefit of "California Depreciation (at a 9.6% marginal tax rate)
1	$ 1,500	$ 1,035	$ 288
2		1,518	230
3		1,449	184
4		1,449	147
5		1,449	118
6			94
7			70
8			52
9			38
10			27

EXAMPLE 3:

In 1982, a California petroleum refiner is required to reduce its NOX emission levels and to comply, installs a selective catalytic reduction system on an exisiting CO boiler at a total cost of approximately $2 million. Further, assume the design is a retrofit in which the system operates in parallel with the flue gas duct as follows: A fan withdraws gas from the flue gas duct of the CO boiler, after which the gas is moved through an in-line heater, discharged through a reactor and then moved back to the flue gas duct. The prinicpal components of the system are the reactor, the catalyst bed, the heater, the ducting and the fan. The system is essentially a self-contained unit except for the ducting running to and from the stack.

Analysis

The system described above comprises tangible property used in the company's business which, since acquired after 1980, will be subject to cost recovery under the ACRS rules. Since the company is not a public utility, does not lease its facilities and presumably will be using a depreciation method expressed in a term of years, none of the ACRS exceptions apply. Therefore, the cost of the property will be recovered based on the percentage provided in the applicable asset recovery class table.

To determine the proper asset recovery class, the analyst must first ascertain whether the property acquired is Section 1245 or Section 1250 property. If the property is Section 1245 property, it will generally be classified as either 3-year or 5-year recovery class property, depending on its ADR class life. If the ADR class life is four years or less, it will be 3-year property. If it is greater than four years, it will be 5-year property. On the other hand, if the SCR system or some position thereof is Section 1250 property, it will generally be classified as 15-year recovery property, thereby significantly reducing the depreciation tax benefit available to the company in the initial years of ownership.

The selective catalytic reduction system described above is arguably comprised entirely of Section 1245 property, although the mechanical components such as the fan, heater and reactor are housed in a separate structure, Section 1245 property is defined as property of a character subject to an allowance for depreciation (or cost recovery) which is either:

1. Personal property, or
2. Other property (not including a building or its structural components) but only if such other property is tangible and is used as an integral part of manufacturing, production, or extraction. Here, the SCR System is tangible property of a character subject to depreciation, with the only question being whether any portion of it is Section 1250 (real property).

Although the SCR System is housed in its own structure, the structure is not a building for purposes of Section 1245, since it is essentially an item of machinery. Further, it houses property used as an integral part of the refining process and is so closely related to the use of the pollution control system that it can be expected to be replaced when the system is replaced. It is not a structure which could be economically used for another purpose. Also, the structure does not provide shelter or housing or working, office, parking, display, or sales space.

As Section 1245 property, the SCR System will be 5-year class property for ACRS purposes, since its ADR class life is in excess of four years. Further, the system should qualify as property eligible for the investment tax credit, since the definition of Section 38 property is esentially the same as that used for ascertaining Section 1245 property.

Energy Credit

If the boiler on which the SCR system is to be installed uses as a primary fuel a substance other than oil or natural gas (or any product thereof), the system also qualifys for a 10% energy credit, assuming it is installed before December 31, 1982.

Tax Benefits

Based on the $2 million cost of the system, if the company chooses to maximize its depreciation deduction, the following tax benefits would be available in the year of acquisition:

Federal

Investment tax credit (10% x $2 million) - $200,000

Depreciation deduction (15% x $2 million) - $300,000

Assuming the Company pays federal taxes at the highest marginal rate (46%), the $300,000 depreciation deduction would provide a tax savings of $138,000. Thus, the total federal tax savings in the year the SCR system is acquired would be $338,000, effectively reducing the cost of the system to $1,662,000. The present value of the federal tax benefits which will be provided by the federal depreciation deductions taken in subsequent years should also be considered in arriving at the actual after tax cost of the SCR system. In addition, the California tax savings must also be considered.

For California purposes, no investment tax credit is allowed. In addition, the allowable deduction for depreciation is not calculated under the ACRS system, since this only applies for federal tax purposes.

The estimated useful life of the SCR system may be significantly greater than five years. The special 5-year amortization available for certified pollution control facilities may provide the most rapid recovery of the system's capital costs.

California

Investment Tax Credit	None
Amortization deduction ($2 million ÷ 5 yrs.)	$400,000

The California corporate tax rate is 9.6% in the year of acquisition, the tax benefit of the $400,000 pollution control facility amortization deduction would be $38,400. Again, the present value of tax savings achieved in subsequent years due to additional amortization should be considered in determining the actual after tax cost of the SCR system.