

LISA A. SKUMATZ, Ph.D

EDUCATION

Ph.D, M.A. Economics, The Johns Hopkins University, Baltimore, Maryland, 1978, 1987.

B.A. Economics, The University of Wisconsin, Madison, Wisconsin, 1975.

EXPERIENCE

1990- Vice President, Pacific Northwest Division, Synergic Resources Corporation.

1987-90 Rates Economist, City of Seattle.

1985-87 Energy Research Analyst, Pacific Gas and Electric Company.

1980-85 Research Economist, Battelle Pacific Northwest Laboratories.

1978-80 Research Economist, U.S. Bureau of Labor Statistics.

1977-78 Economist, U.S. Department of Health, Education, and Welfare.

Dr. Skumatz is currently a Vice President at SRC, and manages SRC's nationwide practice in solid waste. She is an experienced economist in the field of utilities economics. Her background includes a Ph.D. in econometric modeling and thirteen years of experience in integrated planning, forecasting and modeling, market/survey research, and economic and financial analysis. Her experience includes analysis of policy and economic issues in the fields of solid waste and energy.

She is particularly recognized for proposing and forwarding innovative concepts in the field of solid waste, and is nationally recognized in the areas of rates, incentives, financing options, and integrated planning in this field. She conducted pioneering work in weight-based rates and has conducted and monitored field tests and published widely on this topic.

Dr. Skumatz has conducted detailed analysis of appropriate funding options for solid waste agencies to provide a set of integrated, stable, and equitable revenue sources for a wide array of solid waste management responsibilities. Dr. Skumatz has developed workshops, public



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information materials, and briefings for press, politicians, upper management, and financial agencies.

Dr. Skumatz specializes in applying economic and statistical analysis techniques to issues in solid waste, and has worked extensively with various jurisdictions in helping them begin to apply modern integrated approaches in managing waste and applying economic principles to assure more equitable and appropriate programs. With her background in both utilities and consulting, she has the ability to analyze issues from a variety of perspectives, and to develop practical, workable solutions that take into account the perspectives of a variety of interest groups. Dr. Skumatz's experience includes the following:

Analysis of Rates and Incentives

- **Survey of State-Level Legislation on Variable Rates.** Dr. Skumatz conducted a survey of the status of state legislation on variable rates. The survey collected the legislation for states that had adopted the systems, noting whether variable rates are required or "encouraged", as well as identifying the states that had unsuccessfully considered similar legislation and the reasons behind failure. The work analyzed the features of the legislation, comparisons with energy conservation legislation, and developed recommendations for future state legislative initiatives. The work was published in a trade journal.
- **Variable Rates Adoption, Legislation, and Impacts, Reason Foundation.** Dr. Skumatz prepared a wide-ranging research paper on variable rates, including status and implications of community-level adoption in North America. The study examined the range of system types; the impact of the system on set outs, tonnage, and purchasing behavior; legislative impacts; and discussed appropriate methods of evaluating program performance.
- **Survey of Variable Rate Communities in North America.** Dr. Skumatz conducted a comprehensive survey to develop a list of the communities and counties that had implemented variable rates, including the community name, type of program, the number of programs, and the population covered. SRC identified over 1,000 (soon 1,800) communities, and the results were published in a trade journal and cited in the "Wall Street Journal".



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- **Field Test of "Garbage by the Pound".** Dr. Skumatz was an innovator in the field of weight-based rates for residential collection. In order to examine the relative feasibility of such an option, she obtained funding from the Environmental Protection Agency, and managed a field experiment of this innovative new approach in solid waste collection and rates that she called "Garbage by the Pound". This project, recently completed, tested the feasibility of weighing residential garbage cans and charging customers on the basis of the pounds of waste disposed. The project showed there were few significant barriers, that the customers viewed the project very favorably, and that customers significantly reduced the waste put out for collection.
- **Multi-Year Study of Solid Waste System Changes, U.S. Environmental Protection Agency.** Dr. Skumatz worked on a project to study the effects of change in municipal solid waste system on a community, and provide that information in a report that can be used by other decision-makers considering making a change. The project is examining the effects of changes in collection, recycling, and funding mechanisms on the solid waste stream, the effects on illegal dumping, and customer impacts of the new systems, and providing quantitative estimates of the costs and effects.

Rate Studies

- **Implementation of Solid Waste Rates, City of Seattle.** Dr. Skumatz was project manager for implementing the City of Seattle's solid waste rates in 1989. This included implementation of billing system modifications, preparation of press and customer materials, and integration with new collection system and recycling programs.
- **City of Seattle Rate Study.** Dr. Skumatz conducted a comprehensive rates analysis for the City's residential and commercial customers. She developed forecasting equations, cost and financial relationships, worked with a consultant to develop an integrated rate model, and performed scenario analysis and risk evaluation.
- **City of Cincinnati Rate Study.** Dr. Skumatz managed a large comprehensive solid waste rate study and system design project. Conducting extensive technical duties on the project including modeling, forecasting, and rate design.

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- **Variable Rate Feasibility and Rates Study, Village of Oak Park, Illinois.** Dr. Skumatz is directing a project to perform all tasks needed to determine feasibility of alternative variable rates options, and to design and implement a variable rates system. The project involves conduction and analysis of a set-out survey and attitudinal survey, scenario analysis of options, system design and implementation plan, and ultimate calculation of rates needed to support the system.

Variable Rate Feasibility Analysis

- **Variable Rates Incentive System Feasibility Analysis, City of Cincinnati, Ohio.** Dr. Skumatz worked with the City of Cincinnati to evaluate the City's solid waste collection system features, and to evaluate a range of incentive rates alternatives for the City. The project examined operational, cost, customer, legal constraints and political factors, as well as billing system and other implementation factors to select among variable can, hybrid bag, and tag alternatives.
- **Solid Waste Rates Feasibility, City of Anchorage, Alaska.** Dr. Skumatz directed efforts for the Municipality of Anchorage to develop a short- and longer-term plan for establishing a user-fee pricing strategy that will meet the goals of providing low-cost, high-quality service that is environmentally sound and will meet legal requirements. The project involved developing a demand forecast, evaluating a number of user-fee systems, and estimating the pros, cons, and implementation costs associated with each system. Dr. Skumatz managed an analysis of costs and benefits, as well as a survey of customer acceptance.
- **User Fee System Design, Capital Regional District, Victoria, BC.** Dr. Skumatz worked on a team to evaluate the feasibility of various incentives mechanisms for the CRD in Victoria. Dr. Skumatz analyzed alternatives, including variable can, bag, tag, and weight-based systems for implementation within various jurisdictions within the CRD. The analysis examined case studies for lessons from other jurisdictions, studied the *status quo* system in use within the municipalities, identified pros and cons of alternatives given the CRD conditions, and evaluated appropriate incentive mechanisms and implementation recommendations.
- **Variable Collection Rate Feasibility Study, Orange County, California.** Dr. Skumatz contributed to a study of alternative-rate structures for Orange County, California. The study used a case study approach, and



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provided background on the various user-fee options available, and their pros and cons considering the types of collection occurring within Orange County.

- **Solid Waste Rate Feasibility, City of Pasadena, California.** Dr. Skumatz directed an analysis of the feasibility of variable-rate alternatives for the City of Pasadena. She developed an estimate of customer elasticities to determine likely service choices (size of can, yard waste service, recycling activities) and estimated the level of rates for services. She performed scenario analysis to bracket revenue risk and prepared presentations of the new rates for the City Council.
- **Solid Waste Rates Advising, City of Ventura, California.** Dr. Skumatz worked closely with the City of Ventura program and finance staff to evaluate the incentives associated with Ventura's new garbage rate and recycling system, and to design an approach for updating the public, press, and decision-makers on the new system. This included developing notification materials, presentation briefing materials, and responses to potential issues raised through citizen letters, articles, and public hearings.
- **Variable Rate Feasibility, Fort Wayne.** Dr. Skumatz directed a study to assess the benefits and costs of implementing an incentive-based fee in Fort Wayne. She also designed and analyzed a set-out survey to support the study.

Revenue Analysis and Financing/Funding Alternatives

- **Evaluation of Financing System, Portland Metro Solid Waste.** Historically, Metro has relied on tip fees and tip fee surcharges to provide revenues to support the wide array of solid waste planning activities provided by this regional agency. Tonnage misprojections and declining tonnage have led to significant revenue problems for the agency. Dr. Skumatz is using a "best fit funding" approach to examine a wide array of funding and financing options to determine the best set of revenue options for the agency. Dr. Skumatz considered over 40 traditional and innovative revenue sources, including cost recovery options designed for energy conservation, and evaluated them on a range of criteria to determine the most appropriate mix to support Metro's activities. Detailed case studies of options used by solid waste agencies across North America were used to design the options.



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- **Boulder County Financing Plan, Boulder County, Colorado.** As part of a study to evaluate detailed solid waste management alternatives, Dr. Skumatz examined a range of appropriate revenue sources for the new programs and facilities. The work was complicated by the diversity of jurisdictions and powers, the range of funding methods currently used, and the implications of caps on taxing in the state. The plan is designed to help Boulder County achieve 50% waste diversion by the year 2000.
- **King County Solid Waste Comprehensive Plan Financing Methods.** As part of a project to develop recommendations for a County Solid Waste Management Plan, Dr. Skumatz evaluated a range of appropriate revenue and financing alternatives for the recommended programs and facilities. She examined both revenue and ownership alternatives for plan implementation.
- **National Association of Counties.** Dr. Skumatz developed a presentation on "best fit funding" for financing solid waste programs and facilities for the National Association of Counties annual conference.
- **Solid Waste Funding Alternatives, State of Rhode Island.** Dr. Skumatz provided assistance to the State of Rhode Island in preparing legislation related to alternative-funding mechanisms for solid waste services in the state.

Integrated Program Planning and Evaluation/Tracking

- **King County Health Department, Evaluation of the Local Hazardous Waste Management Plan.** Dr. Skumatz is managing a project to conduct an evaluation of King County's Local Hazardous Waste Plan, evaluating the Plan's performance as a whole, as well as the performance of individual components and programs within the plan. The Local Hazardous Waste Management Plan is a coordinated effort by regional agencies to reduce hazardous waste from households and small businesses. The Plan includes six general components, as well as 22 individual programs to address portions of the Hazardous Waste stream in a variety of ways. Evaluation techniques include process and indicator evaluations, pre/post analysis, pre/post analysis with a control group, and econometric regression analysis. Results include cost-benefit analysis of each program and recommendations for improving program operation and efficiency.



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- **Integrated Recycling/Diversion Program Planning, Grand Canyon National Park.** Dr. Skumatz directed a study using the WastePlan(tm) model to develop long term planning and recycling scenarios for the park. The planning challenges include rapidly increasing visitation, reduced landfill capacity, and state or federal mandates for higher levels of waste diversion.
- **King County Solid Waste Comprehensive Plan.** Dr. Skumatz conducted economic tasks of a County Solid Waste Management Plan and worked with King County to develop a recommended list of financing alternatives for funding a variety of County-sponsored waste diversion programs and facilities.
- **Solid Waste Comprehensive Plan, City of Seattle.** Dr. Skumatz was responsible for writing significant portions of Seattle's Solid Waste Comprehensive Plan. This included analyzing short term practices and longer term recommendations in several areas, including rates and incentives, and operational areas like customer service and field inspection activities. Dr. Skumatz has also examined productivity and policies in office and field activities, including trucking and transfer operations.
- **Industrial Waste Survey, Washington State Department of Ecology.** Dr. Skumatz analyzed the types and volume of solid (non-hazardous) waste produced by state industries, as well as the type and adequacy of current management techniques. The project evaluated alternative policy, incentive, or regulatory initiatives that may be needed for particular waste streams, and was integrated into the State's comprehensive solid waste management plan.
- **Seattle Solid Waste Utility, Quarterly Reports.** Dr. Skumatz designed and prepared detailed reports tracking revenues, costs, and tonnages to check performance against utility projections. These reports, issued quarterly, are used by technical and non-technical staff to identify financial or program problems, and to revise the integrated plan. Dr. Skumatz provided briefings on these results to the Council and Mayor, to the press, and to bond rating agencies.
- **City of Seattle, Tracking Programs.** Dr. Skumatz designed and implemented a complex system of data collection, analysis, tracking, and reporting to allow upper management to make decisions on productivity improvements for several operational sectors of the solid waste utility,



including customer service (telephone calls) and field services (garbage "misses"). She conducted a comprehensive evaluation of customer service unit, and developed recommendations to management for improving customer service and procedures.

- **Recycling Options, Bonneville Power Administration.** Dr. Skumatz managed a project to examine the feasibility of options for BPA to use recycled materials or generate recyclables in three phases of operating plant lifetime: 1) construction; 2) O & M; and 3) decommissioning. The project examined 12 plant types and a range of secondary materials and examined the market condition, economic and operating factors, and numerous other factors affecting program feasibility.

Surveys and Market Research

- **Market Research in Solid Waste Rates.** Dr. Skumatz has conducted and managed numerous customer surveys related to the acceptability of incentive rates alternatives in several communities, including variable can, bag, tag, and weight-based systems. She has also conducted and analyzed numerous surveys related to use of programs, customer characteristics and choices related to collection, disposal, and recycling services. She conducted a detailed customer survey on behaviors, attitudes, services and performance related to the Garbage by the Pound field test.
- **Seattle Solid Waste Utility.** Dr. Skumatz performed numerous financial and economic analyses for the solid waste utility. This has included assessing options for funding large capital projects (landfill closure); rate study timing and cash flow issues; and cost-benefit analysis for recycling programs.
- **Village of Oak Park Solid Waste.** Dr. Skumatz developed forecasts of residential customer demand for Village collection and disposal services. The forecast efforts took into account historical disposal patterns, population projections, planned program changes, and price changes in developing forecasts. A set-out survey was also conducted as part of this project.
- **Self-Haul Customers Survey, City of Seattle.** Dr. Skumatz designed and conducted a periodic survey of the Utility's self-haul customers. The survey was designed to examine the waste disposal and recycling activities

of the customers that brought waste, yard waste, or recyclables to Seattle's transfer station. The survey examined materials, weight of materials, and attitudes about service and rate levels. The survey queried customer reactions to rate changes. This on-going survey was used for forecasting, education, and program planning purposes.

- **Variable Rates Market Research Survey, Municipality of Anchorage.** As part of a comprehensive analysis of the feasibility and appropriateness of variable rates in the Municipality, Dr. Skumatz directed a telephone survey of residential customers. The survey queried customers on acceptability of modified rate structures, either bag/tag or variable can systems, their satisfaction with the current rate system; information on the dollar levels of rate incentives needed to encourage waste reduction and recycling; their current waste reduction, recycling and diversion activities; and the adequacy of current programs and service. The survey also conducted important demographic information. The survey was analyzed to determine the potential acceptability of a variable can or bag/tag system, preferences about design features and rate differentials, barriers to successful implementation, and the overall attitudes of customers regarding solid waste collection and recycling service and programs. SRC conducted all phases of the research, including sample and instrument design, fielding, database creation, and analysis and reporting.

Demand Forecasting and Econometric/Statistical Analysis

- **Tonnage Forecasts, Seattle Solid Waste Utility.** Dr. Skumatz developed econometric forecasting models for solid waste disposal tonnage for three major customers sectors, including residential, self-haul, and automobile customers.
- **Solid Waste Forecasting Model, Portland Metro.** Dr. Skumatz evaluated appropriate forecasting techniques for facility and waste stream forecasting for Metro's solid waste system. The project examined the pros and cons of alternatives to deal with problems such as time lags, periodicity and missing peaks, data, and decomposition issues. The end product is a revised forecasting model and a plan for data collection activities and to support further model improvements.
- **Forecasting Models, Yale Working Paper.** Dr. Skumatz prepared a paper for the Yale Working Paper Series demonstrating the derivation and

performance characteristics of econometric forecasting models in Solid Waste.

- **Residential Tonnage Forecasts, City of Cincinnati.** Dr. Skumatz worked with another consultant to derive forecasting models for residential disposal and recycling for use in a rate model. The work involved estimating Cincinnati-specific equations, as well as constructing hybrid models incorporating elasticities from other jurisdictions for scenario analysis.
- **Forecasting Model, Village of Oak Park.** Dr. Skumatz used population, income, and other data to derive a forecast of future tonnage and recycling for the Village in a rate study.
- **City of Cincinnati Solid Waste.** Dr. Skumatz developed an econometric forecasting equation to project demand for the City's disposal services. Issues related to data availability and quality, model specification alternative, and other issues were assessed, and model estimation took two approaches--one in which Cincinnati data was applied, and another using a hybrid approach, incorporating elasticities from other communities for scenario analysis. A detailed set-out survey and weigh/sort was conducted as part of these efforts, and the results will be incorporated into a detailed rates model.
- **Village of Oak Park Solid Waste.** Dr. Skumatz developed forecasts of residential customer demand for Village collection and disposal services. The forecast efforts took into account historical disposal patterns, population projections, planned program changes, and price changes in developing forecasts. A set-out survey was also conducted as part of this project.
- **Solid Waste Rates and Economic Analyses, Various Solid Waste Agencies.** Dr. Skumatz has used billing and customer survey information to develop estimates of customer participation in programs, and customer reactions to price changes. She has also worked with agencies to develop comprehensive cost relationships for solid waste management functions, has evaluated scenarios for use of local vs. distant landfill alternatives; modeling recycling programs and costs; and evaluated alternative rate and incentive design relationships.

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- **Impact of Variable Rates.** Dr. Skumatz conducted a statistical analysis of data from over 50 communities to isolate the impact of variable rate programs on diversion from recycling and yard waste programs.

Manuals and Workshops

- **Unit Pricing Guide, U.S. Environmental Protection Agency.** Dr. Skumatz worked with the EPA to write an updated unit pricing manual to provide a decision-oriented document to guide communities across the nation considering implementing variable rates. The project developed a decision-tree approach to the evaluation of feasibility, includes sections addressing the systems and alternative approaches. The project used a forum approach to provide detail on real-world solutions for communities to consider.
- **Variable Rate Manual, State of Illinois Department of Energy and Natural Resources.** Dr. Skumatz is managing a project to develop a detailed manual for Illinois communities to use in deciding whether variable rates may be an appropriate funding mechanisms for solid waste services. The manual includes case studies of rural and urban communities, and provides detailed steps for evaluating feasibility and designing and tailoring an appropriate variable rate system.
- **Unit Pricing Study, California Integrated Waste Management Board.** Dr. Skumatz is directing the development of four documents in support of the Board's research on variable rates. The documents include a decision support document, an overview fact guide, a system design and implementation guide, and a resource guide. Detailed case studies from across the nation are included to illustrate different systems and implementations.
- **Variable Rates Handbook, U.S. Environmental Protection Agency.** Dr. Skumatz is the primary author of the EPA Manual *Variable Rates in Solid Waste: Handbook for Solid Waste Officials*. This 300-page volume is a comprehensive guide to determining whether a variable rate system is appropriate to a jurisdiction; selecting the most effective and practical structure of rates and incentives; designing and conducting a rate analysis; and determining the timetable and steps involved in implementing the operational changes associated with an integrated solid waste system.



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- **Workshops on User Fees.** Dr. Skumatz has conducted workshops on user fees in solid waste for a number of clients, including Environment Canada, Greater Vancouver Regional District, Environmental Protection Agency, the University of Wisconsin, Yale University and other clients. She has given dozens of presentations at professional conferences related to her work in solid waste.
- **Articles and Manuals on Rates and Incentives in Solid Waste.** Dr. Skumatz has authored numerous articles on rates and incentives for professional journals and conferences. These papers address practical methods of approaching the problem of decreasing landfill space, and methods the jurisdictions may use to increase the effectiveness of their recycling programs. She has consulted with a number of jurisdictions on approaches that may be practical in their jurisdiction considering the particular configuration of the solid waste system and the legal and practical constraints they face. Her work has also covered the state-level legislative initiatives on variable rates. She has prepared wide-ranging policy papers for the Reason Foundation and other clients.

PROFESSIONAL ACTIVITIES

Dr. Skumatz is a member of the American Economic Association, Western Economic Association, Washington State Recycling Association, National Recycling Coalition, Association of Environmental and Resource Economists, American Water Works Association, International Association of Energy Economists, Western Economics Association, National Alliance of Women in Waste, Seattle Economists Club, Seattle Association of Women Economists, and the Econometric Society.

SELECTED REPORTS AND PUBLICATIONS

"Effects of Variable Rate Pricing on Waste Diversion and Planning Practices", presented for Texas Natural Resources Conference, Austin, Texas, January 1994.

Workshop on Variable Rate Pricing for BC Municipalities and Solid Waste Planning Agencies, two one-day workshops conducted for BC Ministry of the Environment, Kamloops, BC; Prince George, BC, December 1994.

"Introducing the Hybrid Variable Rate System", *BioCycle*, November 1993.



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Program Evaluation Design Reports, (coauthor) prepared for Local Hazardous Waste Management Plan, Seattle/King County, Washington, November/December 1993.

Unit Pricing: Quantity Based Disposal Rates Manual, (coauthor), prepared for Illinois DENR, Springfield, Illinois, January, 1994.

Variable Rates for Cincinnati: Rate Study Results and Recommendations, (coauthor) prepared for City of Cincinnati, Ohio, January, 1994.

Task 2: Variable Rate System Design and Operations, prepared for City of Cincinnati, Ohio, January, 1994.

"Forecasting Solid Waste Tonnage: Techniques and Alternatives" presented for the Ninth International Conference on Solid Waste Management", Philadelphia, Pennsylvania, November 1993.

Phase II: Variable Rate Solid Waste Rate Study, (coauthor) prepared for Village of Oak Park, Oak Park, Illinois, September, 1993.

Solid Waste Funding Alternatives and Revenue Options, prepared for Portland METRO, Portland, Oregon, October, 1993.

"Incentive Rates in Solid Waste" presentation for Air and Waste Management Association/EPA Conference, Rochester, NY, November 1993.

"Variable Rates in Solid Waste: Status and Case Studies", presented for Southern States Annual Environmental Conference, Biloxi, Mississippi, October, 1993.

"The Hybrid Variable System: Best of Both Worlds?", presented for Biocycle Regional Conference, Austin, Texas, November, 1993.

"Program Evaluation: Accounting for Program Impacts" presented at National Recycling Coalition, Nashville, Tennessee, October 1993.

"Variable Rates: Background and Case Studies", presentation for Coalition of Northeast Governors Workshop, Albany, New York, September 1993.

"Innovative Financing Options for Solid Waste Programs and Facilities", presentation for National Association of Counties National Convention, Chicago, Illinois, July 1993.



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"Survey of Innovative International Waste Management Initiatives", (coauthor), memo report prepared for Procter and Gamble, Cincinnati, Ohio, July, 1993.

Implementation Options for Recycling/Reuse at Electric Generating Facilities, (coauthor), prepared for the U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon, July, 1993.

"Variable Rates Initiatives in State Legislation", presentation for ASTSWMO, Lake Buena Vista, Florida, July, 1993.

"**Community adoption of variable rates: an update**", (primary author), *Resource Recycling*, June 1993.

Review of Metro's Forecasting of the Demand for Solid Waste Disposal Services: Phase II - Development of Forecasting Models, (primary author), prepared for Portland METRO, Portland, Oregon, June, 1993.

"**Variable Rates in Municipal Solid Waste Strategies: Experience and the Roles of Economics and Regulation**", prepared for the Reason Foundation, Los Angeles, California, June, 1993.

User Fee Pricing Guidebook: Unit Pricing System Design and Implementation Guide, (coauthor), prepared for the California Integrated Waste Management Board, Draft Document 3, June, 1993.

"Volume-Based Pricing: Benefits, Problems, and Proven Strategies", presentation at "Cost Effective Collection of Recyclables and Solid Waste", 2-day workshop, University of Wisconsin at Madison, School of Engineering, Madison, Wisconsin, June, 1993.

Unit Pricing Guide, (coauthor), prepared for the U.S. EPA, Washington, DC, May, 1993.

User Fee Pricing Guidebook: Unit Pricing System Design Support Document, (coauthor), prepared for the California Integrated Waste Management Board, Draft Document 1, May, 1993.

Options to Recycle or Reuse Recycled Materials at BPA Region Electric Generating Facilities, (primary author), prepared for U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon, May, 1993.

"GVRD Workshop on Variable Rates", one-day workshop on Variable Rates for Vancouver Area Governments, May, 1993.



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Review of Metro's Forecasting of the Demand for Solid Waste Disposal Services: Phase I - Review of Basic Forecasting Issues, (primary author), prepared for Portland METRO, Portland, Oregon, April, 1993.

"Evaluating Cost Effectiveness of Recycling and Rate Programs", presentation for Pacific Recyclers Expo, Association of Bay Area Governments, San Jose, California, April, 1993.

"Conducting A Defensible Evaluation of Recycling Programs: Impact Evaluation Techniques", presentation for SWANA British Columbia Chapter Meeting, Vancouver, BC, April, 1993.

"Variable Rate Initiatives: What Western States are Doing; Program Evaluation" presentation for BioCycle West Coast Conference '93, Seattle, Washington, March, 1993.

Phase I Report: System Design Recommendations for Village of Oak Park, Illinois, Final Report, (coauthor), prepared for Oak Park, Illinois, with appendices, February, 1993.

City of Cincinnati Task 2: Variable Rate System Design and Operations, Draft Report (primary author), prepared for City of Cincinnati, February, 1993.

Industrial Solid Waste Survey: Industrial Waste of Concern in Washington, (coauthor), prepared for Washington State Department of Ecology, Olympia, Washington, February, 1993.

Industrial Solid Waste Survey: Future Study in Industrial Solid Waste, (coauthor), prepared for Washington State Department of Ecology, Olympia, Washington, February, 1993.

"Waste Collection Practices - Variable Rates and Collection Frequency of Municipal Solid Waste", (coauthor and presentation), for Sixth Annual Conference "Solid Waste Management Options for Texas '93", Austin, Texas, January, 1993.

"Variable Rates Initiatives at the State Level", (primary author), *BioCycle*, December 1992.

Econometric Findings in Solid Waste: Demand, Customer Choice, and Reactions to System Change", Yale Working Paper Series, Draft Paper, New Haven, CT, December, 1992.

Industrial Solid Waste Survey: Summary of State Regulations, (coauthor), prepared for Washington State Department of Ecology, Olympia, Washington, June, 1992.

"Variable Rates for Solid Waste can be Your Most Effective Recycling Program", *The Journal of Resource Management and Technology*, March, 1991.



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"New Techniques for Evaluating Recycling Programs: Impact Analysis", for ASTSWMO, Portland, Oregon, July 1992.

"Accountability and Monitoring for Recycling Programs", for California Resource Recovery Association, Long Beach, California, July 1992.

"Experience and Issues in Variable and Weight-Based Rates", for the California Integrated Waste Management Board, Sacramento, California, June 1992.

"Theory and Practice of Weight-Based Solid Waste Rates", for the Washington Utilities and Transportation Commission Rates Workshop, Tacoma, Washington, February 1992.

"The Feasibility of Weight-Based Trash Systems", for National Recycling Congress, Milwaukee, Wisconsin, October, 1991; International Conference on Waste Management, Philadelphia, Pennsylvania, December 1991; U.S. EPA Conference on Municipal Solid Waste Management, Arlington, Virginia, June 1992.

A CRD-Wide User Pay System for Solid Waste, (coauthor), prepared for the Capital Regional District, Victoria, BC, Canada, January 1992.

Issue Paper on Financing/Funding Options for Programmatic and Facilities-Based Waste Reduction and Recycling Initiatives for King County, (coauthor), Prepared for King County, Washington, December 1991.

"Integrated Solid Waste Management", lectures for Yale Graduate School of Management, New Haven, Connecticut, October 1991.

Variable-Rate Incentive Program Feasibility Study, City of Cincinnati, Ohio, (coauthor), prepared for City of Cincinnati, November 1991.

Variable Collection Rate Feasibility Study, (contributing author), prepared for the County of Orange Integrated Waste Management Department, August 1991.

"**Garbage by the Pound: The Potential of Weight-Based Rates**", *Resource Recycling*, July, 1991.

Garbage by the Pound Pilot Project Summary, (coauthor), City of Seattle, April 1991.

"Parallels between Energy Rate Structures and Waste Reduction and Recycling", for Association of Bay Area Governments, November 1991.



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"Seattle's Weight-Based Trash Experiment", *Solid Waste and Power*, July, 1991.

"Variable Rates Diminish Solid Waste Streams", *City and State*, February 25, 1991.

"Comprehensive Comparison of Residential User Fee Pricing Strategies", (coauthor), prepared for the Municipality of Anchorage Solid Waste Services, February 1991.

"Evaluating Recycling and Variable Rates Programs", presented at BioCycle Conference, Seattle, Washington, March 1991.

"Incentives in Solid Waste: Their Role in Integrated Planning and Encouraging Waste Reduction and Recycling", July 1990, presented at the ASTSWMO Conference on Integrated Solid Waste Management.

Variable Rates in Solid Waste: Handbook for Solid Waste Officials, Volumes I and II, (primary author), June 1990, prepared for the U.S. Environmental Protection Agency, EPA #910/9-90-012a and 012b.

"Variable Rates in Solid Waste: Approaches for Providing Incentives for Recycling and Waste Reduction and a More Efficient Solid Waste System", May 1990.

"The Buck is Mightier than the Can", in *BioCycle*, January 1990.

"Garbage by the Pound", in *Resource Recycling*, November 1989.

"Volume-Based Garbage Rates: Your Best Recycling Program", in *Resource Recovery*, October, 1989.

Solid Waste Utility Quarterly Report, (primary author), prepared for City of Seattle Solid Waste Utility, 1989, 1990.

"Economic Issues in the Solid Waste Field: Comparisons with the Case of Electricity", (author) June 1989.

Volume-Based Pricing in Solid Waste: Seattle's Experience, 1989.

1989/1990 Solid Waste Rate Study, (coauthor), prepared for Seattle Solid Waste Utility, 1988.

Solid Waste Rate Design Options, prepared for City of Seattle Solid Waste Utility, 1987.

(Author, unless otherwise stated. Publications in Bold; Reports in Italics)

