

## Education and Certifications

Ph.D., Systems Science/Economics, Portland State University

B.S., Economics, Portland State University

## Professional Experience and Qualifications

Dr. M. Sami Khawaja is an expert in program design and evaluation methods. Dr. Khawaja's skills encompass program theory and planning, implementation, and evaluation. During his more than three-decade career, he has led over 100 energy efficiency projects.

Nationally recognized for his expertise, Dr. Khawaja is a contributing author to the following documents:

- International Performance Measurement and Verification Protocol
- National Action Plan for Energy Efficiency Program Impact Evaluation Guide
- Electric Power Research Institute Impact Evaluation Guide
- U.S. Department of Energy Uniform Methods Project

Before serving as an chief economist, Dr. Khawaja led the Energy Services Sector from 2008 through 2013. Before joining Cadmus, he was the founder of Quantec, LLC, which merged with Cadmus in 2008.

## Relevant Experience

### *Energy Efficiency*

Dr. Khawaja has been particularly active in developing real-time tracking systems that allow for continual program evaluation and midcourse corrections. Early in his career, he was one of the chief evaluators of the Hood River Conservation Project, which was the nation's largest test of energy efficiency programs to date.

### *Statistical Analysis*

Dr. Khawaja has conducted statistical and economic analysis for over 20 years for clients worldwide. His experience encompasses statistical sampling design, ranging from simple random sampling for some residential surveys to more sophisticated sampling design for quality control of large commercial and industrial programs. He is well-versed in common sampling techniques in load research, including ratio-based and model-based statistical sampling.

### *Expert Testimony*

- Appeared before the Indiana Regulatory Commission to defend Vectren's request for lost margin recovery, 2017.
- Appeared before the Washington Utilities and Transportation Commission to discuss Avista Utilities' energy efficiency program evaluations, 2012 and 2014.
- Prepared testimony for the Public Utilities Commission of Ohio to discuss Dayton Power & Light's demand-side management (DSM) evaluation effort, 2011 and 2014.

- Prepared testimony for the Michigan Public Utilities Commission to discuss Consumers Energy's evaluation effort, 2011 and 2014.
- Appeared before the Utah Public Utilities Commission to discuss PacifiCorp's energy efficiency potentials assessment and its renewable plan, 2008.
- Appeared before the Oregon Public Utilities Commission in the River and Bar Pilots rate case, 2004.
- Appeared before the Utah Public Utilities Commission in the HELP low-income evaluation case, 2002.

### *Teaching and Training*

Since 1984, Dr. Khawaja has taught courses in the departments of Management and Economics at Portland State University, where he is an adjunct professor. In addition, he is cofounder of the Applied Energy Economics and Policy graduate certificate program.

### *Professional Workshops and Trainings*

Dr. Khawaja has taught more than 50 workshops for clients throughout the United States and internationally. He is also a designated trainer for the Association of Energy Services Professionals.

### *Cost Effectiveness*

Dr. Khawaja has been conducting cost effectiveness analysis of energy efficiency and renewable projects for three decades. He teaches cost effectiveness workshops throughout the country. He is one of the contributing authors to the newly released National Standard Practice Manual for Cost Effectiveness.

### *International Experience*

- For Jamaica Public Service Company, Dr. Khawaja led the evaluation efforts of its World Bank-sponsored residential and commercial energy efficiency programs between 1998 and 2004. He also conducted numerous training workshops for Jamaica Public Service staff on topics ranging from evaluation, to cost-effectiveness, to statistical analysis.
- For the Electricity Generation Authority of Thailand, Dr. Khawaja conducted evaluations of its various DSM efforts and conducted a three-day evaluation workshop.
- For the General Electricity Company of Libya, Dr. Khawaja led a large DSM potential estimation. The work will also include designing up to six pilot programs, assessing their regulatory structure, and examining the opportunities in setting codes and standards. He taught three workshops: introduction to DSM, financial analysis, and statistical modeling.
- For various Jordanian energy companies and regulatory agencies, Dr. Khawaja taught an all-day workshop on the essentials of DSM.

### **Publications**

Dr. Khawaja has published work in *Contemporary Policy Issues*, *Energy Services Journal*, *The Journal of Applied Mathematics and Decision Sciences*, *Water Policy*, *Quirk's Market Research*, *Electricity Journal*, *Energy Magazine*, and *The American Journal of Agricultural Economics*. He also has over 50 conference presentation and papers.

### *M. Sami Khawaja, PhD, Senior Vice President*

M. Sami Khawaja, PhD, is an expert in program design and evaluation methods. Dr. Khawaja's skills encompass program theory and planning, implementation, and evaluation. During his more than three-decade career, he has led more than 100 energy efficiency projects. Nationally recognized for his expertise, Dr. Khawaja is a contributing author to the *International Performance Measurement and Verification Protocol*, *National Action Plan for Energy Efficiency Program Impact Evaluation Guide*, *Electric Power Research Institute Impact Evaluation Guide*, and the U.S. Department of Energy *Uniform Methods Project*. He routinely provides expert testimony on behalf of clients. He is well-versed in common statistical sampling techniques. He regularly teaches workshops on cost-effectiveness, demand-side management, evaluation, planning, program design, and statistical methods, having taught over 30 workshops throughout the United States and internationally.

Since 1984, Dr. Khawaja has taught courses in the departments of Management and Economics at Portland State University, where he is an adjunct professor and co-founder of the Applied Energy Economics and Policy graduate certificate program. Before serving as chief economist, he led Cadmus' Energy Services from 2008 through 2013. Dr. Khawaja was the founder of Quantec, LLC, which merged with Cadmus in 2008.

### Relevant Experience

#### *Impact Evaluation*

- **Evaluation.** For more than 35 years has conducted impact evaluations of over 100 energy efficiency and renewable programs throughout the United States and internationally.

#### *Modeling and Forecasting*

- **Statistical Modeling and Advanced Analytics.** Over 35 years of providing leadership and guidance of numerous studies that involved statistical and economic analysis, including statistical sampling design ranging from simple random sampling for residential surveys to more sophisticated sampling design for quality control of large commercial and industrial programs. Has led studies that use regression modeling, discriminant analysis, logistical regression, conjoint analysis, contingent valuation, and linear programming.

#### *Economic Analysis*

- **Cost-Effectiveness Analysis.** Over 35 years of cost-effectiveness analysis of many energy efficiency and renewable projects.

#### *Expert Testimony*

- **Vectren Energy: Expert Testimony (2017).** Appeared before Indiana Regulatory Commission to defend request for lost margin recovery.
- **Avista Utilities: Expert Testimony (2012 and 2014).** Appeared before the Washington Utilities and Transportation Commission to discuss energy efficiency program evaluations.
- **Dayton Power & Light: Expert Testimony (2011 and 2014).** Prepared testimony for the Public Utilities Commission of Ohio to discuss demand-side management evaluation effort.
- **Consumers Energy: Expert Testimony (2011 and 2014).** Prepared testimony for the Michigan Public Utilities Commission to discuss evaluation effort.

### Teaching and Training

- **Portland State University: Adjunct Professor (1984-present).** Teaches courses in the departments of Management and Economics. Co-founded the Applied Energy Economics and Policy graduate certificate program.
- **Association of Energy Services Professionals: Trainer (over 10 years).** Designated trainer on the topics of introductory demand-side management, statistical analysis, cost-effectiveness analysis, and impact evaluation.
- **Numerous United States Clients (over 30 years).** Taught workshops directly to clients (Dayton Power & Light, Cinergy, PacifiCorp, Avista, Consumers Energy, Indiana Utilities, and Wisconsin Focus on Energy, and Nest) and internally to Cadmus staff.
- **Numerous International Clients (over 20 years).** Taught workshops directly to international clients in Thailand, the Phillipines, Jordan, Jamaica, and Libya.

### Education and Certifications

PhD, Systems Science/Economics, Portland State University

BS, Economics, Portland State University

### Publications and Presentations

#### White Papers

Khawaja, M. Sami, and James Stewart. 2014. "Long-Run Savings and Cost-Effectiveness of Home Energy Report Programs." The Cadmus Group.

Khawaja, M. Sami. 2013. "Residential Efficiency Crossroads: Opportunities for the Future." The Cadmus Group.

Skumatz, Lisa A., M. Sami Khawaja, and Richard Krop. "Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low Income Program Analyses in California."

Skumatz, Lisa A., M. Sami Khawaja, and Jane Colby. "Findings and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Retention from Energy Efficiency Behavior." Prepared for Council on International Educational Exchange.

#### Protocols

Khawaja, M. Sami, J. Rushton, and J. Keeling. 2017. *The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures*. "Chapter 11: Sample Design Cross-Cutting Protocol." Golden, Colorado. National Renewable Energy Laboratory. NREL/SR-7A40- 68567. <http://www.nrel.gov/docs/fy17osti/68567.pdf>

Khawaja, M. Sami. (Chair). June 2014. "Statistics and Uncertainty for International Performance Measurement and Verification Protocol."

Khawaja, M. Sami (Lead Author). June 2001. "Impact Evaluation Guide." Electric Power Research Institute.

### *Academic Journals*

Koss, Patricia, and M. Sami Khawaja. 2001. "Value of Water Supply Reliability in California: A Contingent Valuation Study." *Water Policy* 3, no. 2: 165-174.

Khawaja, M. Sami., Patricia Koss, and Brian Hedman. 2001. "System Benefits Charge: Economic Impacts and Implications." *The Electricity Journal*.

Dimetrosky, Scott, M. Sami Khawaja, and Phil Degens. January 2001. "Best Practices for Online Survey Research." *Quirk's Marketing Research Review*.

Khawaja, M. Sami. 1999. "Strategic Staffing Model for Electric Utilities." *Journal of Applied Mathematics & Decision Sciences* 3, no. 2:195-202.

Kanninen, Barbara J., and M. Sami Khawaja. February 1999. "Measuring Goodness of Fit for the Double-Bounded Logit Model: Reply." *American Journal of Agricultural Economics* 81, no. 1: 238-240.

Kanninen, Barbara J., and M. Sami Khawaja. November 1995. "Measuring Goodness of Fit for the Double-Bounded Logit Model." *American Journal of Agricultural Economics* 77, issue 4: 885-890.  
<https://doi.org/10.2307/1243811>

Khawaja, M. Sami, Thomas Potiowsky, and H. Gil Peach. July 1990. "Cost Effectiveness of Conservation Programs: The Hood River Experiment." *Contemporary Policy Issues*.

### *Fortnightly*

Khawaja, M. Sami, Hossein Haeri, and Brian Hedman. December 2014. "Finding Common Ground on Energy Efficiency: Policy Recommendations for Utilities and Regulators." *Fortnightly Magazine*.

Haeri, Hossein, and M. Sami Khawaja. July 2013. "Valuing Energy Efficiency: The Search for a Better Yardstick." *Fortnightly Magazine*.

Haeri, Hossein, and M. Sami Khawaja. March 2012. "The Trouble with Freeriders." *Fortnightly Magazine*.

Stewart, James I., and M. Sami Khawaja. June 2008. "The Politics of Carbon: The 2008 Elections Portend Federal Regulation of Greenhouse Gases by 2010." *Fortnightly Magazine*.

Haeri, Hossein, Matei Perussi, and M. Sami Khawaja. February 15 1999. "The Fortnightly 100 Revisited: Do Utility Stock Prices Reflect Operational Efficiency?" *Fortnightly Magazine*.

Forrester, Janice, M. Sami Khawaja, Hossein Haeri, and Michael Carter. September 1, 1998. "The Fortnightly 100: Which Utility Ranks the Highest?" *Fortnightly Magazine*.

Haeri, Hossein, M. Sami Khawaja, and Matei Perussi. June 15, 1997. "Competitive Efficiency: A Ranking of U.S. Electric Utilities." *Public Utilities Fortnightly*: 26-33.

Degens, Philipp, and M. Sami Khawaja. November 15, 1996. *Fortnightly Magazine*.

### *Home Energy Magazine*

Khawaja, M. Sami, and Patricia Koss. March 8, 2007. "Building Better Weatherization Programs: Low-Income Programs Can Benefit from Better Tracking Data." *Home Energy Magazine*.

Khawaja, M. Sami, and Jill Steiner. October 2005. "Energy Efficiency Through Education and Low-Cost Measures." *Home Energy Magazine*.

Khawaja, M. Sami, and Colin Elliot. September/October 2005. "Energy Efficiency Through Education and Low-Cost Measures." *Home Energy Magazine*.

### *Conferences*

Koran, Bill, Erik Boyer, M. Sami Khawaja, Josh Rushton, and Jim Stewart. November 1-2, 2017.

"Comparison of Approaches to Estimating the Time-Aggregated Uncertainty of Savings Estimated from Meter Data." International Energy Program Evaluation Conference, Bangkok, Thailand.

Reeves, Scott, Jamie Drakos, and M. Sami Khawaja. August 10-13, 2015. "New Opportunities in Low-Income Energy Conservation Programs" International Energy Program Evaluation Conference, Long Beach, California.

Lee, Allen, M. Sami Khawaja, and Nicholas Hall. August 10-13, 2015. "Perspectives on Program Influence and Cost Effectiveness: Moving Forward from the Recent US Debates." International Energy Program Evaluation Conference, Long Beach, California.

Hall, Nick, David Ladd, and M. Sami Khawaja. August 13-15, 2013. "Setting Net Energy Impact Baselines: Building Reliable Evaluation Approaches." International Energy Program Evaluation Conference, Chicago, Illinois.

Perussi, Matei, David Jacobson, M. Sami Khawaja, Wendy Todd, and Rohit Vaidya. August 16-18, 2011. "Igniting the Pilot Light: Impact Evaluation Methods for Time-of-Replacement Gas Heating and Water Heating Programs." International Energy Program Evaluation Conference, Boston, Massachusetts.

Drakos, Jamie, M. Sami Khawaja, and Jennifer S. Pitzer. August 16-18, 2011. "Increasing Property Values and Decreasing Forced Mobility: Analysis of Nonenergy Benefits for Low-Income Programs" International Energy Program Evaluation Conference, Boston, Massachusetts.

Levy, Michelle, M. Sami Khawaja, and Lynn Benningfield. August 14-16, 2007. "Putting Codes Into Action: How Newly Updated Building Codes Translate Into Practice." International Energy Program Evaluation Conference, Chicago, Illinois.

Drakos, Jamie, and M. Sami Khawaja. August 14-16, 2007. "Energy Efficiency and Energy Education for Low-Income Households" International Energy Program Evaluation Conference, Chicago, Illinois.

Lee, Allen D., M. Sami Khawaja, and Michelle Levy. August 14-16, 2007. "Using Simplified Pattern Matching to Define Program Theory and Assess Program" International Energy Program Evaluation Conference, Chicago, Illinois.

Drakos, Jamie, M. Sami Khawaja, and Anne West. August 14-16, 2007. "Impact of Flipping the Switch: Evaluating the Effectiveness of Low-Income Residential Energy Education Programs." International Energy Program Evaluation Conference, Chicago, Illinois.

Bronfman, Ben, Doug Bruchs, and M. Sami Khawaja. August 17-19, 2005. "Checking the Temperature." International Energy Program Evaluation Conference, New York, New York.

Robison, David, Howard Reirchmuth, and M. Sami Khawaja. 2004. "Use of Billing Simulation Tool for Performance Measurement and Verification."

Bailey, Alan, M. Sami Khawaja, and Shon Kraley. August 20-22, 2003. "A Novel Approach to the Evaluation of Lighting Programs: The National Grid Energy Initiative Lighting Program." International Energy Program Evaluation Conference, Seattle, Washington.

Khawaja, M. Sami, and Jill Steiner. August 20-22, 2003. "When a Hero Comes Along: Expanding the Market Share for ENERGY STAR Homes." International Energy Program Evaluation Conference, Seattle, Washington.

Woods, James, and M. Sami Khawaja. 2001. "Multi-Attribute Valuation for Cost-Effective Evaluation of Market Transformation and Other Hard to Quantify Programs." International Energy Program Evaluation Conference, Chicago, Illinois.

Dimetrosky, Scott, M. Sami Khawaja, Connie Colter, and Philipp Degens. 2001. "Market Transformation and Awareness: The Best Program May Be the One Nobody's Heard Off." International Energy Program Evaluation Conference, Chicago, Illinois.

Khawaja, M. Sami, Patricia Koss, and Sonja Rice-Power. 1999. "Assessment of Non-Energy Benefits of Low-Income Programs: The Indiana REACH Program." International Energy Program Evaluation Conference, Denver, Colorado.

Robison, David, Howard Reichmuth, and M. Sami Khawaja. 1999. "Impact Evaluation of Commercial Construction Using Alternative Engineering Simulation Tools." International Energy Program Evaluation Conference, Denver, Colorado.

Haeri, Hossein, M. Sami Khawaja, Jennifer Stout, and Jamshid Hosseini. 1997. "Market Transformation: Measuring the Immeasurable." International Energy Program Evaluation Conference, Chicago, Illinois.

Khawaja, M. Sami, and Jamshid Hosseini. 1995. "A Comparative Application of the FLDF and Hybrid LP Modeling Approaches to the Discriminant Problem."

Reichmuth, Howard, and M. Sami Khawaja. 1995. "Energy Savings from Comprehensive Multifamily DHW Retrofit." International Energy Program Evaluation Conference.

Khawaja, M. Sami, and Hossein Haeri. 1995. "Analysis Studies of TOU Rates and their Effectiveness." DA/DSM, San Jose, California.

Scott, Steven, and M. Sami Khawaja. March 1995. "Lighting Load Shape Field Surveys." Western Load Research Association, Bend, Oregon.

Haeri, Hossein, M. Sami Khawaja, and Steve Scott. March 1995. "One Lumpor Two? The Potential Pitfalls of Load Aggregation." Western Load Research Association, Bend, Oregon.

Khawaja, M. Sami, Jamshid C. Hosseini, and Scott R. Robinson. 1994. "Developing and Calibrating Logit Models for Large, Imbalanced Data: An Energy Conservation Program Targeting Application." Proceedings of the Academy of Marketing Science Annual Conference, p. 286-290.

Khawaja, M. Sami, and Jamshid Hosseini. May 1993. "Discrete Choice Models in Residential DSM Program Targeting: Identifying Consumers' Hot Buttons." Presented at an invited session in Multiattribute Modeling at the TIMS/ORSA Joint National Meeting, Chicago, Illinois.

Khawaja, M. Sami, and Jamshid Hosseini. November 1991. "A Comparative Application of Performance of the FLDF and the Hybrid LP Modeling Approaches to the Discriminant Problem: The Super Good Cents Energy Conservation Project." Proceedings of the 22nd Annual Decision Sciences Institute Meeting, Miami Beach, Florida, p. 970-972.

Hosseini, Jamshid, and M. Sami Khawaja. November 1991. "Performance of the Hybrid LP Model Versus FLDF: A Monte Carlo Experiment." Proceedings of the 22nd Annual Decision Sciences Institute Meeting, Miami Beach, Florida, p. 967-969.

Zeiber, Alan, Thomas Potiowsky, and M. Sami Khawaja. 1991. "Why Should Electric Utilities Advocate Conservation Efforts." Pacific Northwest Conference, Portland, Oregon.

Khawaja, M. Sami, and Jamshid Hosseini. May 1990. "An Application of the LP Approaches to the Discriminant Problem: The Hood River Conservation Project." Presented at TIMS/ORSA National Meeting, Las Vegas, Nevada.

Khawaja, M. Sami, Tom Potiowsky, and Scott Robinson. July 1990. "Linear Programming Versus Least Square Estimation: A Case Study in Electricity Estimation." 65th Western Economic Association Conference.