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Issues:	Net-to-Gross Ratios
Witness:	Michael L. Stahlman
Sponsoring Party:	MO PSC Staff
Type of Exhibit:	Surrebuttal Testimony
File No.:	EO-2012-0009
Date Testimony Prepared:	May 10, 2012

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

SURREBUTTAL TESTIMONY

OF

MICHAEL L. STAHLMAN

KCP&L GREATER MISSOURI OPERATIONS COMPANY

FILE NO. EO-2012-0009

Jefferson City, Missouri
May 2012

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of KCP&L Greater Missouri Operations Company's Notice of Intent to File an Application for Authority to Establish a Demand-Side Programs Investment Mechanism	)))))	Case No.: EO-2012-0009

AFFIDAVIT OF MICHAEL L. STAHLMAN

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

Michael L. Stahlman, of lawful age, on his oath states: that he has participated in the preparation of the following Surrebuttal Testimony in question and answer form, consisting of 13 pages of Surrebuttal Testimony to be presented in the above case, that the answers in the following Surrebuttal Testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

[signature]

Michael L. Stahlman

Subscribed and sworn to before me this 9th day of May, 2012.

LAURA HOLSMAN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 21, 2015
Commission Number: 11203914

Laura Holsman
Notary Public

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FILE NO. EO-2012-0009

Q. Please state your name and business address.

A. Michael L. Stahlman, P.O. Box 360, Jefferson City, Missouri 65102.

Q. By whom are you employed and in what capacity?

A. I am a Regulatory Economist with the Missouri Public Service Commission (Commission).

Q. Please describe your background.

A. I have been employed with the Commission as a Regulatory Economist since 2010. I graduated *summa cum laude* from Westminster College in Fulton, Missouri, in 2007 with a Bachelor of Arts degree majoring in Economics, and from the University of Missouri in 2009 with a Master of Science degree in Agricultural Economics. Further details are attached to this testimony as Schedule MLS-1.

Q. What is the purpose of your surrebuttal testimony?

A. I present Staff's response to the rebuttal testimony of Office of the Public Counsel (OPC) witness Ryan Kind, and Natural Resources Defense Council, Sierra Club and Renew Missouri (NRDC) witness Phillip Mosenthal. Specifically, I respond to their testimony regarding KCPL Greater Missouri Operations Company's (GMO or Company) proposed use of a net-to-gross (NTG) ratio equal to 1.0 when the Company prospectively estimates annual energy and demand savings for its demand-side management (DSM) programs and when the Company retrospectively calculates annual energy and demand savings for its performance incentive component of its demand-side programs investment mechanism (DSIM).

My surrebuttal testimony on NTG ratios and use of deemed savings supports Staff's recommendation that the performance incentive component of GMO's DSIM be implemented on a retrospective basis—that is, at the end of the three-year Missouri Energy Efficiency Investment Act (MEEIA) plan, with all energy and demand savings used to calculate that incentive being measured and verified through a full evaluation, measurement and valuation (EM&V). As explained in my testimony, a third-party EM&V evaluator should decide to establish a NTG ratio for each program, then apply that NTG ratio to a program's gross energy savings to arrive at a measurable and verifiable amount of net energy savings, for which the Commission is required by the MEEIA statute to provide a timely earnings opportunity.

I explain Staff's support for OPC witness Kind's recommendation that estimates of program performance should not be used as a replacement for determining program performance by using estimates of net savings that are verified by EM&V.

Staff disagrees with NRDC Witness Philip Mosenthal's recommendation to use prospective NTG ratios in lieu of retrospective NTG ratios calculated by a knowledgeable independent evaluator. It is Staff's view that the best way to determine net savings from DSM programs is to measure the actual savings retrospectively, and that the determination of how to measure and verify those savings is best left to independent third-party evaluators.

Q. How is your testimony organized?

A. First, I define NTG ratios and explain why they are significant. Second, I explain the components that make up a NTG ratio. Next, I discuss applying NTG ratios. Finally I summarize Staff's conclusions on these matters.

<u>Definition and general significance of NTG ratios</u>

Q. What is the NTG ratio?

A. The NTG ratio is the percentage of total energy efficiency gains that directly result from a particular energy efficiency program. For example, a program with an NTG ratio of 90 percent indicates that, on average, 90 percent of the gross energy efficiency savings are directly attributed to the program.

The NTG ratio is used to adjust the cost-effectiveness results "so that they only reflect those energy efficiency gains that are attributed to, and are the direct result of, the energy efficiency program in question."[1] The NTG ratio helps evaluators more accurately estimate energy (kWh) and demand (kW) savings achieved as a direct result of DSM program expenditures "by removing savings that would have occurred even absent a conservation program."[2]

Q. Why should the Commission be concerned about NTG ratios?

A. The NTG ratio provides important information when the Commission determines whether a utility is receiving a timely earnings opportunity associated with cost-effective measurable and verifiable efficiency savings.

As explained by NRDC witness Mosenthal in his rebuttal testimony, the NTG ratio is used to calculate the utility's demand-side programs investment mechanism (DSIM) recovery (p 10, ll 11-15). The MEEIA statute and MEEIA rules allow the utility to retain a portion of

[1] National Action Plan for Energy Efficiency ("NAPEE") 2008, p 4-9.
[2] NAPEE 2008, p 4-9.

annual net shared benefits as an incentive for delivering cost-effective demand-side programs. Thus, a high NTG ratio is good for both the utility and the ratepayer—the higher the NTG ratio, the more the utility will recover, and the more benefits the ratepayer will receive from the demand-side programs.

However, artificially assuming a NTG ratio equal to 1.0 (rather than calculating a NTG ratio based on retrospective EM&V) eliminates the incentive for GMO to minimize free riders and maximize spillover, which can result in the actual NTG ratio being lower than the assumed ratio. As NRDC witness Mosenthal explains in his rebuttal testimony, a NTG ratio is essential for estimating "the actual net savings attributable to the DSM program (compared to what would have occurred if the program did not exist)" (p 11, ll 16-17). Establishing a NTG ratio means verifying that the Company earns the incentive payments made through the DSIM. Moreover, an improper NTG ratio "creates significant perverse incentives that could encourage GMO to pursue strategies that ultimately are not in the best interest of ratepayers, but could provide GMO with excess earnings" (p 10, ll 6-8), such as favoring measures that consumers would likely install without incentives.

OPC witness Kind also recognizes the importance of NTG ratios in designing effective programs that minimize free ridership (p 22). The 2008 National Action Plan for Energy Efficiency (NAPEE) guide, *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*, states, "Establishing the NTG [ratio] is critical to understanding overall program success and identifying ways to improve program performance." (p 4-9). Skumatz et al. (2009) state:

> Not examining free ridership and spillover ex post will make it impossible to distinguish and control for poorly designed / implemented programs, as well as for programs that may have declining performance over time and may have

> outlived their usefulness, at least in their current incarnation. Some interviewees said 'deemed savings are ridiculous' for this reason.[3]

In addition, the 2007 NAPEE guide, *Model Energy Efficiency Program Impact Evaluation Guide*, at page 5-1, states:

> Generally speaking, net savings are of most interest for regulated government and utility programs: the responsible party (for example, a city council or utility regulator) wants to know if the use of public or ratepayer funded programs are actually having an influence.

These studies all agree that it is important to examine the components of the NTG ratio in order to properly evaluate the effectiveness of program design and implementation.

Q. Can a utility influence the NTG ratio?

A. Yes. A utility can take action to minimize free riders and maximize spillover. Both OPC witness Kind[4] and NRDC witness Mosenthal[5] explain that GMO can influence the NTG ratio. Additionally, Commission Rules 4 CSR 240-3.164 (2)(C) 15. and 16.[6] contemplate a utility's potential to influence the NTG ratio in a way that will result in more effective, efficient energy efficiency programs. Because of this potential, it is important for "[a]ny utility incentive component of a DSIM [to be] implemented on a retrospective basis and all energy and demand savings used to determine a DSIM utility incentive revenue requirement must be measured and verified through EM&V."[7] This creates an incentive for a utility to analyze its energy efficiency programs and make adjustments to improve NTG ratios.

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[3] Skumatz et al., 2009, p 6
[4] p 22, ll 10 through 12
[5] p 10, ll 6 through 8
[6] Rule 4 CSR 240-3.164(2)(C)15.-16. provides: "When a electric utility files for approval of demand –side programs or demand-side program plans as described in 4 CSR 240-20.094(3), the electric utility shall file or provide a reference to which commission case contains the following information… (C) Detailed description of each proposed demand-side program to include at least:… 15. Description of any strategies to reduce free riders; 16. Description of any strategies used to maximize spillover."
[7] 4 CSR 240-20.093(2)(H)3.

Q. Does NRDC witness Mosenthal advocate a retrospective examination of the components of the NTG ratio for each of GMO's programs?

A. No. Mr. Mosenthal is willing to deem the NTG ratios based on prior evaluations. He makes two chief arguments for deeming NTG ratios, but both arguments cannot be true at the same time. The first argument is that deeming provides certainty to GMO,[8] and the second is that the evaluated savings will not be substantially different from the deemed savings[9].

Q. How does Staff's recommendation differ from that of Mr. Mosenthal?

A. Staff agrees with OPC witness Kind that "the performance incentive should be based on the level of annual net benefits achieved and verified through Evaluation, Measurement and Verification including the net to gross (NTG) factors verified through EM&V"[10] in accordance with Commission Rule 4 CSR 240-20.093(2)(H)3. During this EM&V process, a third-party evaluator should decide what components[11] to analyze in calculating the NTG ratio for each program, and how to determine gross savings. A knowledgeable, independent, third party evaluator should be the one to arrive at a measurable and verifiable amount of energy savings for which the Commission is required to provide timely earnings opportunity.

In contrast, simply assuming that the NTG ratio equals one eliminates the evaluator's opportunity to study how well the programs are actually working and "will make it impossible to distinguish and control for poorly designed / implemented programs, as well as for

[8] Phil Mosenthal p 28, ll 12-14
[9] Phil Mosenethal p 28, ll 15-16
[10] Ryan Kind, p 4, ll 12-14
[11] Components such as free ridership, spillover, etc.

programs that may have declining performance over time and may have outlived their usefulness, at least in their current incarnation."[12]

Components of NTG ratios

Q. What are some examples of components of NTG ratios?

A. The 2008 NAPEE guide identifies six key components addressed through NTG ratios: free riders, spillover, installation rate, persistence/failure, rebound effect, and take-back effect. However, the number of key components addressed in the NTG ratio and the definition of those components is not consistent from study to study. For instance, the 2007 NAPEE guide, referred to in the 2008 NAPEE guide above, cites only three primary components mentioned in the 2008 NAPEE guide—free riders, spillover and rebound—and a fourth component not mentioned, transmission and distribution losses.

Q. Do Mssrs. Mosenthal and Kind discuss the components of NTG ratios?

A. Yes. Mr. Mosenthal focuses on two components: free ridership and spillover. Mr. Kind mainly focuses on free ridership.

Q. How are the six key components of NTG ratios described in the 2008 NAPEE guide?

A. The 2008 NAPEE guide describes the six key components as follows:

- "Free riders" are customers who take advantage of the incentives available through energy efficiency programs even though they would have installed the efficient equipment on their own without the program incentives.
- The "spillover effect" is customers who adopt efficiency measures because they are influenced by program-related information and marketing efforts, but they do not actually take the incentives and are thus not participating directly in the program.

[12] Skumatz et al., 2009, p 6

- The "installation rate" takes into account measures that are not installed or removed after installation, such as a customer who removes a compact fluorescent light bulb (CFL) because the customer does not like the light.
- The "persistence/failure" component attempts to correct for measures that fail or are removed prior to the end of useful life.
- The "rebound effect" and "take-back effect" are similar in that both are an increase in usage due to a perception of reduced price or bills, but the rebound effect also includes increased usage in the times before or after the savings occur. An example of the rebound effect which is not take-back is a program that limits air conditioning during a peak hour; the energy saved during that time can be consumed later when the air conditioning is trying to catch up.

Q. How are the four key components of NTG ratios described in the 2007 NAPEE guide?

A. The 2007 NAPEE guide described the four key components as follows:

- The free rider factor is similar to the free rider in NAPEE 2008, but is divided into three groups: full, partial, and non-free rider. The partial free rider is a person who would have installed a less-efficient model without the rebate but more than baseline.
- The spillover effects in the 2007 NAPEE guide is also more extensively defined than in the 2008 NAPEE guide; it includes extra actions participants take because of program participation, market transformation that occurs as a result from the program, energy efficiency design changes by architects and engineers as a result of a program, and changes in energy use by non-participants that occurs as a result from the program.
- The rebound factor is also similar to NAPEE 2008, although take-back is treated as a subset of the rebound factor.
- The final factor, transmission and distribution losses, attempts to correct energy savings for the differences between savings that occur at the point of use to the savings that occur at generation.

This guide also lists some non-key factors that can determine NTG ratios, such as the state of the economy, energy prices, and changes in facility operations. Staff's view is that a knowledgeable third-party EM&V evaluator can best decide what components to examine in calculating a NTG ratio for a particular energy efficiency program.

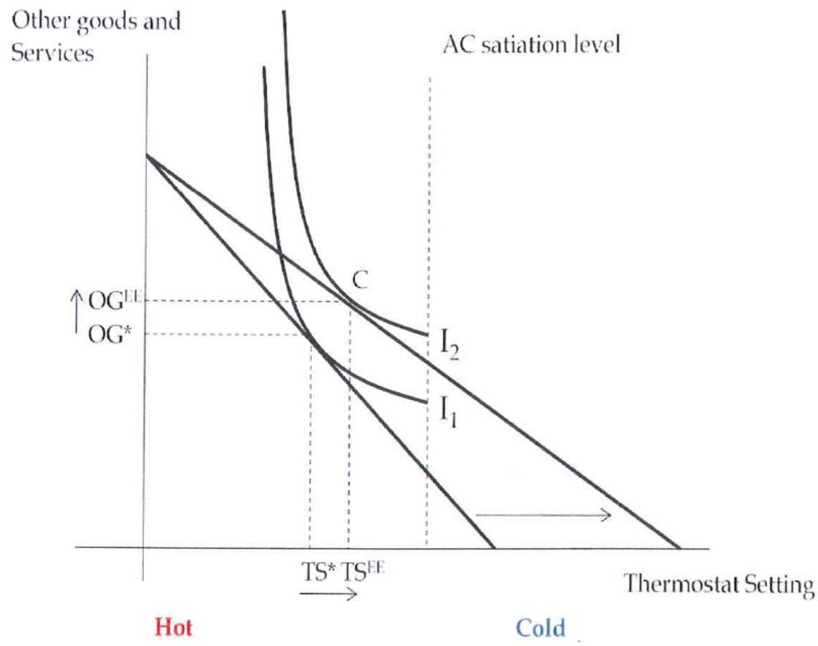
Q. Can you describe the rebound effect in greater detail?

A. Yes. The rebound effect was first noted by W. S. Jevons in "The Coal Question" (1866) when he noted that aggregate amount of coal consumed in the United Kingdom paradoxically increased rather than decreased as the efficiency of coal-fired steam engines increased.[13] Similar observations have been made about the consumption of gasoline with improvements in automobile efficiency.

The rebound effect is generally divided into three categories: direct rebound, indirect rebound, and an economy-wide effect (also known as the Jevons paradox, general equilibrium effect, and the Khazzoom-Brookes postulate).[14] The direct and indirect rebound effects can be seen graphically in Figure 1 below.

[13] Croucher, 2010
[14] Croucher, 2010

Figure 1: Individual in Equilibrium after a More Efficient AC Unit is Installed



Source: Croucher, 2010

In this example, an individual installs a more efficient air conditioning unit which changes the marginal cost of cooling the house. As a result, the individual reacted to the lower marginal cost by lowering their thermostat setting from TS* to TS^{EE}, which is the direct rebound effect. The reduced cost, in this example, also allows the individual to increase his/her purchases of other goods and services, which, if they consume energy, further reduce net energy savings. This indirect rebound effect is the movement of OG* to OG^{EE}.[15] The economy-wide effect, which is not graphed, is essentially that the increase in efficiency can result in the increased productivity of the whole economy, which can result in the consumption of more resources.[16]

Lutzenhiser et al. (2010) notes that current modeling techniques are insufficient in explaining real world energy use in part because they generally fail to take behavior [rebound]

[15] Croucher, 2010
[16] Croucher, 2010

into account. "The differences between building-level simulation model results and real world energy use is commonly as much as 80-100%."[17]

Q. What is the significance of the rebound effect?

A. The significance is that excluding rebound can result in substantially overestimated net benefits and lost margins. Croucher (2010a) states, "Frankly though, utilities can only assist with ensuring that *opportunities* or the *potential* to reduce electricity consumption is put in place… . The final decision to reduce electricity consumption ultimately resides with the utilities [sic] customer" (p 15 – 16). Lutzenhiser et. al. (2010) states that modeling household energy consumption "involves hundreds of potentially important factors" and faces several issues, including "variability in consumption within and across households, data quality issues, conflicts among various modeling approaches and underlying theoretical constructs, and tacit beliefs about causal relationships" (p 7-167). Even though energy use appears to be a smooth transition from peaks to valleys when all the households are aggregated, the aggregation really masks large variations within a household, and even larger variations between households; the "differences in environmental conditions, building performance, appliances, and the interactions behavior of other factors… [result in] some households consuming 10-15 times as much energy as others." (p 7-175) Some households that were designed with energy efficiency in mind (including the installation of energy efficient equipment) resulted in higher energy use than conventional households![18]

Again, evaluators may look at a number of different factors in order to select the most accurate NTG ratio possible for a given program. As discussed in Staff Witness John Rogers' surrebuttal testimony, by simply assuming that the NTG ratio equals one, the evaluators and

[17] Lutzenhiser et al., 2010, p 7-168
[18] Lutzenhiser et. al. 2010

the state as a whole will miss this important opportunity to judge a program's cost effectiveness.

Applying NTG

Q. What components of NTG ratios are generally adjusted in an evaluation?

A. NRDC witness Mosenthal states that the NTG ratio is generally adjusted for free ridership and spillover. This is consistent with Skumatz et al. (2009), which states that the main adjustments are these two factors, and to a lesser extent the rebound or take-back effects. However, some other components of the NTG ratio may be accounted in adjustments to the gross savings. For example, GMO's evaluation of the cool homes program adjusted for the installation rate of CFLs with a gross adjustment factor rather than in the NTG ratio.

Q. On page 28 of Mr. Mosenthal's rebuttal testimony, he states that deeming NTG ratios based on previous studies will not be substantially different from evaluated results. Do you agree?

A. Not necessarily. The 2011 lighting program evaluation for New York City and state states that "[A recommended NTG ratio of 0.41] is substantially lower than the NTG ratio produced in the 2008 multistate modeling effort (1.06), but the reduction in the NTG ratio is in keeping with the trends in other mature program areas, such as California and Massachusetts, which also saw NTG ratios plummet in a short period of time."[19] Additionally, the Energy Independence and Security Act of 2007 can also have a large impact on the NTG ratios. Although there is currently no enforcement funding, this act is still the law. Table 1 discusses the transition dates:

[19] NMR Group, Inc., 2011, p 7-1

Table 1: EISA Transition Dates and Coverage

Tier	Effective Date	EISA-Rated Lumen Ranges	Efficacy Requirement	Major Incandescent Wattage Categories Affected (W)
1	2012	1,490 -2,600	Maximum wattage: 72 W~21-36 lumens/W	100 and 150
	2013	1,050 -1,489	Maximum wattage: 53 W~20-28 lumens/W	75
	2014	750 -1,049	Maximum wattage: 43 W~17-24 lumens/W	60
	2014	310-749	Maximum wattage: 29 W~11-26 lumens/W	40
2	2020	All	No less than 45 lumens/W*	All

* EISA Tier 2 will require all lamps to have an efficacy of at least 45 lumens/W unless higher standards are otherwise determined by DOE.

Note: For more information, see http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_public_laws&docid=f:publ140.110.pdf

Source: 2010 CFL Market Profile - Energy Star, http://www.energystar.gov/ia/products/downloads/CFL_Market_Profile_2010.pdf

Conclusion

Q. Please summarize Staff's position.

A. Staff disagrees with NRDC Witness Philip Mosenthal's recommendation to use prospective NTG ratios in lieu of retrospective NTG ratios calculated by a knowledgeable independent evaluator.

Staff agrees with OPC witness Ryan Kind's recommendation that estimates of program performance should not be used as a replacement for determining program performance through a NTG ratio calculated by a full EM&V.

Q. Does this conclude your surrebuttal testimony?

A. Yes.

References

Croucher , M. (2010). "Potential Problems to Maximizing Energy Efficiency Savings in Arizona." http://seidmaninstitute.com/wp-content/uploads/2011/01/Problems-for-energy-eff.pdf (22MAR2012).

Croucher, M. (2010a). "What is Important when Modeling the Economic Impact of Energy Efficiency Standards in Arizona?" http://seidmaninstitute.com/wp-content/uploads/2011/01/Determinants-of-the-Economic-Impact-for-EE.pdf (22MAR2012).

Lutzenhiser, L., M. Moezzi, D. Hungerford, and R. Friedmann. (2010). "Sticky Points in Modeling Household Energy Consumption." http://eec.ucdavis.edu/ACEEE/2010/data/papers/2144.pdf (12MAR2012).

National Action Plan for Energy Efficiency (NAPEE). (2007). "Model Energy Efficiency Program Impact Evaluation Guide." http://www.cee1.org/eval/evaluation_guide.pdf (22MAR2012).

National Action Plan for Energy Efficiency (NAPEE). (2008). "Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers." http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf (22MAR2012).

NMR Group, Inc. (2011). "Results of the Multistate CFL Modeling Effort." http://www.nmrgroupinc.com/pdf/MA%20Multistate%20Regression%20Model.pdf (26APR12).

Skumatz, L.A., M.S. Khawaja, J. Colby, and The Cadmus Group. (2009) "Lessons Learned and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Persistence of Energy Efficiency Behavior." http://uc-ciee.org/downloads/EEM_A.pdf (22MAR2012).

Background of Michael Stahlman

CASE INVOLVEMENT

AO-2011-0035 – Status Reports of Energy Efficiency Advisory Groups and Collaboratives
GC-2011-0045 – SMNG Complaint Case
GR-2010-0347 – SMNG Small Rate Case
GC-2011-0339 – OPC v MGE Complaint Case
GR-2010-0363 – Ameren Missouri Rate Case
GM-2011-0354 – MGU/SMNG Merger
GT-2011-0049 – MGE Energy Efficiency Tariff Filing
GT-2011-0335 – Atmos Energy Efficiency Tariff Filing
GT-2011-0410 – Ameren Missouri Energy Efficiency Tariff Filing
EO-2012-0142 – Ameren Missouri Missouri Energy Efficiency Investment Act

COLLABORATIVE/ADVISORY GROUP INVOLVEMENT

Ameren Missouri, Atmos Energy Corporation, Empire District Gas, Laclede Gas Company, Missouri Gas Energy (MGE)

EDUCATION

2009	M. S., Agricultural Economics, University of Missouri, Columbia.
2007	B.A., Economics, Summa Cum Laude, Westminster College, Fulton, MO.

PROFFESIONAL EXPERIENCE

2010 -	Regulatory Economist, Missouri Public Service Commission
2007 – 2009	Graduate Research Assistant, University of Missouri
2008	Graduate Teaching Assistant, University of Missouri
2007	American Institute for Economic Research (AIER) Summer Fellowship Program
2006	Price Analysis Intern, Food and Agricultural Policy Research Institute (FAPRI), Columbia, MO
2006	Legislative Intern for State Representative Munzlinger
2005 – 2006	Certified Tutor in Macroeconomics, Westminster College, Fulton, MO
1998 – 2004	Engineering Watch Supervisor, United States Navy

SELECTED MANUSCRIPTS AND POSTERS

Stahlman, Michael, Laura M.J. McCann, and Haluk Gedikoglou. "Adoption of Phytase by Livestock Farmers." Selected poster at the American Agricultural Economics Association Annual Meeting, Orlando, FL, July 27-29, 2008. Also presented at the USDA/CSREES Annual Meeting in St. Louis, MO in February 2009.

McCann, Laura, Haluk Gedikoglu, Bob Broz, John Lory, Ray Massey, and Michael Stahlman. "Farm Size and Adoption of BMPs by AFOs." Selected poster at the 5th National Small Farm Conference in Springfield, IL in September 2009.

Stahlman, Michael. "The Amorality of Signals." Awarded in top 50 authors for SEVEN Fund essay competition, "The Morality of Profit."

Pending: Stahlman, Michael and Laura M.J. McCann. "Technology Characteristics, Choice Architecture and Farmer Knowledge: The Case of Phytase." For Agriculture and Human Values