COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

JOINT APPLICATION OF LOUISVILLE GAS	**)**	
AND ELECTRIC COMPANY AND KENTUCKY	**)**	
UTILITIES COMPANY FOR REVIEW,	**)**	
MODIFICATION, AND CONTINUATION OF	**)**	**CASE NO. 2014-00003**
EXISTING, AND ADDITION OF NEW,	**)**	
DEMAND-SIDE MANAGEMENT AND ENERGY	**)**	
EFFICIENCY PROGRAMS	**)**	

Direct Testimony of
Tim Woolf
Synapse Energy Economics

On Behalf of Wallace McMullen and Sierra Club

April 14, 2014

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1. INTRODUCTION AND QUALIFICATIONS.

Q. Please state your name, title and employer.

A. My name is Tim Woolf. I am a Vice President at Synapse Energy Economics, located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity and gas industry regulation, planning and analysis. Our work covers a range of issues, including integrated resource planning; economic and technical assessments of demand-side and supply-side energy resources; electricity market modeling and assessment; energy efficiency policies and programs; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients, including attorneys general, offices of consumer advocates, public utility commissions, environmental advocates, the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), U.S. Department of Justice, the Federal Trade Commission and the National Association of Regulatory Utility Commissioners. Synapse has over twenty five professional staff with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. My resume, attached as Exhibit TW-1, presents a summary of my professional and educational experience.

Before joining Synapse Energy Economics, I was a commissioner at the Massachusetts Department of Public Utilities (DPU). In that capacity, I was responsible for overseeing a significant expansion of clean energy policies, including significantly increased ratepayer-funded energy efficiency programs; an update of the DPU energy efficiency guidelines; the implementation of decoupled rates for electric and gas companies; the promulgation of net metering regulations; review of smart grid pilot programs; and review and approval of long-term contracts for renewable power. I was also responsible for overseeing a variety of other dockets before the commission, including several electric and gas rate cases.

Prior to being a commissioner at the Massachusetts DPU, I was employed as the Vice President at Synapse Energy Economics; a Manager at Tellus Institute; the Research Director of the Association for the Conservation of Energy; a Staff Economist at the Massachusetts DPU; and a Policy Analyst at the Massachusetts Executive Office of Energy Resources.

I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, and a BS in Mechanical Engineering and a BA in English from Tufts University.

Q. Please describe your professional experience as it relates to energy efficiency policies and programs.

A. Energy efficiency policies and programs have been at the core of my professional career. While at the Massachusetts DPU, I played a leading role in updating the Department's energy efficiency guidelines, reviewing and approving utility three-year energy efficiency plans and utility annual energy efficiency reports, leading a working group on rate and bill impacts of utility energy efficiency programs, and advocating for allowing energy efficiency to participate in the New England wholesale electricity market.

I served as a co-chair of the Working Group on Utility Motivation as part of the State Energy Efficiency Action Network, a state- and local-led effort sponsored by DOE and EPA. In this capacity, I worked with commissioners and consumer advocates from around the country to improve the regulatory policies supporting utility energy efficiency programs.

As a consultant, I have reviewed and provided recommendations concerning utility energy efficiency policies and programs throughout the United States and in Canada, and I have testified on these issues in British Columbia, Colorado, Delaware, Massachusetts, Minnesota, Nevada, Nova Scotia, Québec, and Rhode Island. My work has encompassed all aspects of energy efficiency program design and implementation, including cost-benefit analyses, avoided costs, efficiency potential studies, efficiency measure assessments, program delivery options, program budgeting, utility performance incentives and other relevant regulatory policies. I have also represented clients on several energy efficiency collaboratives, where policies and programs were discussed and negotiated among a variety of stakeholders, including utilities, commission staff,

consumer advocates, and efficiency advocates. I work for a variety of clients on energy efficiency issues, including consumer advocates, environmental advocates, regulatory commissions and DOE.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Wallace McMullen and Sierra Club.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to review Louisville Gas and Electric Company's and Kentucky Utilities Company's (together, the Companies) proposed 2015-2018 Demand-Side Management (DSM) and Energy Efficiency (EE) Program Plan (DSM/EE Plan), and the Companies' underlying studies and supporting testimony. I offer several recommendations for how the DSM/EE Plan can be improved to increase the benefits available to the Companies' customers and the Companies, including lower system costs and energy bills due to energy savings.

Q. Have you previously testified before the Kentucky Public Service Commission?

A. Yes. I testified in Case No. 2012-00578 on behalf of Sierra Club.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.

Q. Please summarize your primary conclusions.

A. My primary conclusions are summarized as follows:

- The Companies' existing DSM/EE programs are highly cost-effective and provide significant benefits to customers. Overall, every dollar that the Companies spend on DSM/EE programs results in roughly three dollars in reduced electric system costs.

- The Companies significantly understate the benefits of energy efficiency by failing to include the avoided costs of complying with environmental regulations and program participant non-energy benefits (NEBs) in their cost-benefit analyses. Consequently, many of the Companies' findings and proposals in this docket are premised on understated benefits, and thus miss significant opportunities to reduce customer costs.

- The Companies have not provided sufficient justification for deciding not to seek to extend some of their DSM/EE programs after 2014. The programs that are set to expire have been highly cost-effective, could continue to be cost-effective, and could provide additional energy savings and other important benefits to customers.

- The Companies have not evaluated the opportunities available from industrial DSM/EE programs, despite an interest among their industrial customers for such programs, and are therefore missing opportunities to achieve a significant amount of cost-effective savings.

- The Energy Efficiency Potential study prepared for the Companies suffers from several significant limitations that result in an underestimation of the economic and achievable potential for efficiency savings.

- The Companies could further reduce costs by expanding their DSM/EE Plan to include additional program designs, to include larger program budgets, and to reach greater numbers of customers.

Q. Please summarize your recommendations.

A. The existing programs appear to be cost-effectively saving energy, but the Companies could achieve greater cost-effective savings if they addressed several deficiencies in their proposal and underlying analyses. Therefore, I recommend that the Commission conditionally approve the Companies' DSM/EE Plan. In particular, the Commission should approve the DSM/EE Plan, as long as the Companies commit to the following conditions:

- Continue to offer the Residential High Efficiency Lighting, Residential New Construction, HVAC Tune-Up and the Dealer Referral programs, which are set to expire this year.

- Expand the program budgets for the modified programs so that the modifications enhance the programs, rather than shift the focus from one customer sector/measure to another.

- Begin offering industrial customers energy efficiency services as soon as is practical during the 2015-2018 plan period. This could be accomplished fairly

easily during this period by expanding the Commercial Conservation program to provide tailored services to industrial customers.

- Develop and implement more state-of-the art DSM/EE program delivery designs to improve the efficacy of the programs, *e.g.*, by using upstream programs to reduce the cost of efficiency measures sold in retail stores without the need for rebates.

- Increase the budgets for several efficiency programs that serve key customer types. This should include the Residential Low Income Weatherization (WeCare), the Residential Conservation, and the Commercial Conservation programs.

Furthermore, I recommend that, for future DSM/EE Plans, the Commission require the Companies to improve their methodologies and assumptions regarding their DSM/EE cost-effectiveness and potential analyses. Specifically, the Companies should:

- Include the best available estimates of the costs of complying with current and future environmental regulations, including future state and federal regulations requiring reduced emissions of greenhouse gases (GHG), in their avoided cost estimates.

- Include the best available estimates of participant non-energy benefits, in both the Participant and the Total Resource Cost (TRC) tests.

- Include a detailed description, analysis and proposal for Industrial DSM/EE programs.

- Improve their DSM potential analysis by examining all customer sectors; considering new and developing technologies; including all of the benefits of DSM/EE, and applying more reasonable approaches to estimate the achievable potential.

3. SUMMARY OF THE COMPANIES' FILING.

Q. What are the Companies seeking in this case?

A. The Companies are seeking approval of their proposed DSM/EE Plan for 2015 to 2018, provided as Exhibit MEH-1, along with associated cost recovery tariffs. In support of the

proposed DSM/EE Plan, the Companies provided an Energy Efficiency Potential Study (Exhibit MEH-3) and a DSM Program Review (Exhibit MEH-2), both of which were performed by The Cadmus Group, Inc. (Cadmus), and Smart Meter Study (Exhibit DEH-1) prepared by DNV KEMA Energy and Sustainability (KEMA).

Four-Year DSM/EE Plan

Q. Please describe the Companies' proposed 2015-2018 DSM/EE Plan.

A. Of the programs approved in Case No. 2011-00134, the proposed DSM/EE Plan calls for modification of five existing programs, allowing four existing programs to expire at the end of the year, and no changes to five existing programs that are approved through 2018. In addition, the Companies propose one new program, Advanced Metering Systems. Table 1, below, summarizes some key metrics about the proposal, program by program.

Table 1. Summary of Proposed Program Budgets, Energy Savings, and Changes in 2015-2018 DSM/EE Plan

		Four-Year Budget		Four-Year Savings		Proposed
Sector	Program	($000)	(% of Total)	(GWh)	(% of Total)	Change
Res.	High Efficiency Lighting	0	0%	0	0%	Expire
Res.	New Construction	0	0%	0	0%	Expire
Res.	HVAC tune-up	0	0%	0	0%	Expire
Res.	Dealer Referral Network	0	0%	0	0%	Expire
Res.	Incentives Program	16,422	9%	101	13%	Modify
Res.	Conservation Program	9,156	5%	21	3%	Modify
Res.	Smart Energy Profile	13,555	8%	426	54%	No change
Res.	Load Management	56,007	31%	11	1%	No change
Res.	Refrigerator Removal	8,466	5%	30	4%	No change
Low-Inc.	Low Income/WeCare	25,539	14%	30	4%	No change
Com.	Load Management	8,244	5%	30 (MW)	N/A	Modify
Com.	Conservation/ Incentive	13,538	8%	173	22%	Modify
Com. & Res.	Customer Education	16,643	9%	N/A	N/A	Modify
Com. & Res.	Advanced Metering Systems	5,709	3%	N/A	N/A	New
Com. & Res.	Development & Admin.	5,788	3%	N/A	N/A	No change
All of Above	Totals	179,067	100%	792	100%	---

(Sources: Exhibit MEH-1; the Companies' 2011 DSM/EE Program Plan, Exhibit MEH-1, Volume I, KPSC Case No. 2011-00134).

Cumulatively, the Companies project that the Plan will result in approximately 792 GWh, 232 MW, and 1036.6 MCF of savings by 2018. (Response to KPSC-1, Question No. 2).[1] The Plan is projected to result in roughly 200 GWh of annual energy savings in 2018, equivalent to 0.58% of projected 2018 retail sales. (Response to SC-1, Question No. 6). The projected savings are roughly in line with savings associated with the Companies' existing programs for 2013 (through November), equal to 167 MWh or roughly 0.56% of retail sales. (Response to SC-1, Question No. 3(c)).

Efficiency Potential Study

Q. Please provide an overview of the Potential Study.

A. In the Potential Study, Cadmus analyzed the technical, economic, and achievable potential for electric and natural gas efficiency for residential and commercial customers in the Companies' service territories. The study examined existing and new construction for a range of building types, vintages, and end uses for the residential and commercial sectors only. (Exhibit MEH-3, p. 1).

In sum, Cadmus found the following:[2]

- By 2033, the technical potential for electric energy efficiency savings is 22% of base energy sales for the residential and commercial sectors.
- By 2033, the economic potential for electric energy efficiency savings is roughly half of the technical potential, equal to 10% of base energy sales.
- By 2033, the achievable potential for electric energy efficiency savings might range from 3.9% to 6.1% of base energy sales.

(Exhibit MEH-3, p. 3, 5, Tables 1 and 2). Further, Cadmus concluded that the achievable potential in the Companies' service territories will be exhausted by 2020. (*Id.* at p. 47).

[1] Copies of all data responses referenced in this testimony are attached as Exhibit TW-2.
[2] Additional details concerning the Potential Study are provided in Section 8.

DSM Program Review

Q. Please describe the DSM Program Review.

A. The Companies commissioned Cadmus to review their 2012 to 2018 program plan in tandem with Cadmus' analysis of energy efficiency potential. The DSM Program Review included "a detailed consideration of the Company's existing programs, a gap analysis to identify any potential new program measures and delivery options resulting from the Potential Study, secondary research on a range of programmatic topics, and development of recommendations for each program moving forward." (Exhibit MEH-2, p. 1).

4. THE IMPORTANCE OF SUCCESSFUL DSM/EE PROGRAMS.

Q. Why is it important that the Companies implement successful, cost-effective DSM/EE programs?

A. DSM/EE programs provide customers with a variety of benefits. First and foremost, cost-effective DSM/EE programs reduce electricity system costs, thereby reducing customers' bills. As I describe above, every dollar that the Companies spend on DSM/EE programs results in three dollars of savings for customers. The Companies' proposed programs are expected to reduce electricity system costs by roughly $330 million. If the Commission were to adopt my recommended improvements to the 2015-2018 DSM/EE Plan, then customers would see even greater net reductions in costs.

DSM/EE programs offer several other important benefits to the Companies and their customers, including reduced risk associated with fuel prices and power plant costs, improved reliability, reduced costs of complying with current and future environmental regulations, assistance for low-income customers with high energy burdens, and reduced costs for local businesses and industries. If DSM/EE opportunities are not taken full advantage of, then customers will be deprived of some of these important benefits.

Q. Has Kentucky established statewide goals for energy efficiency?

A. Yes. Governor Steve Beshear issued his energy strategy, "Intelligent Energy Choices for Kentucky's Future: Kentucky's 7-Point Strategy for Energy Independence," in November 2008.[3] Improving the efficiency of Kentucky's homes, buildings, industries and

[3] The Governor's Energy Strategy, *Intelligent Energy Choices for Kentucky's Future: Kentucky's 7-Point Strategy for Energy Independence*, is available at http://energy.ky.gov/Documents/Final_Energy_Strategy.pdf.

transportation fleet is the first strategy in the Governor's plan to achieving efficient, sustainable energy solutions. The plan highlights energy efficiency's cost effectiveness potential, stating "[n]ot only does energy efficiency result in savings today, the savings are compounded over time as energy prices continue to rise. Dollar for dollar, energy efficiency is one of the best energy investments Kentucky can make."[4] As part of this action plan, Governor Beshear set a goal that energy efficiency will offset at least 18 percent of Kentucky's projected 2025 energy demand.[5] More recently, in 2013, the Kentucky Department for Energy Development and Independence (DEDI) and Midwest Energy Efficiency Alliance (MEEA), through the Stimulating Energy Efficiency in Kentucky (SEE KY) process, issued a Kentucky Action Plan for Energy Efficiency that outlines annual electric savings goals ramping up to 1% in 2015 and each year thereafter through 2025.[6]

Q. Has the Commission expressed support for DSM/EE?

A. Yes. For example, the Commission's integrated resource planning (IRP) regulation, 807 K.A.R. 5:058, requires a utility to consider demand-side programs in developing its IRP. This includes identifying and describing existing DSM programs; accounting for existing and continuing DSM programs in the load forecast; describing DSM resources that are not already in place but are considered for inclusion in the plan; providing detailed information about the energy and peak savings and other impacts of each new DSM program; and describing the criteria used to screen each resource alternative, including DSM. The Commission has found that "the requirement of the IRP regulation to develop a lowest possible cost resource plan does effectively treat cost-effective energy efficiency programs as a priority resource," (Case No. 2008-00408, PSC Order, October 6, 2011, p. 21), and has affirmed "its support for greater energy efficiency." (Case No. 2008-00408, PSC Order, July 24, 2012, p. 10).

[4] *Id.* at 15.
[5] *Id*. at 13.
[6] DEDI and MEEA, Stimulating Energy Efficiency in Kentucky: Kentucky's Action Plan for Energy Efficiency ("SEE KY Action Plan"), p.55 (May 15, 2013), available at http://energy.ky.gov/Programs/Documents/Action%20Plan%205-15-2013.pdf.

Q. What findings has the Commission made with regard to DSM/EE programs offered by Kentucky utilities in general?

A. The Commission has consistently encouraged Kentucky utilities to increase their DSM program efforts. "For over 30 years, the Commission has historically noted the importance of energy efficiency (conservation) as a ratemaking standard [as] '[i]t is intended to minimize the 'wasteful' consumption of electricity and to prevent consumption of scarce resources.'" (Case No. 2012-00221, PSC Order, December 20, 2012, p. 7).

In recent years, the Commission has repeatedly stated its belief that "DSM, energy efficiency, and conservation are important now and will become more important and cost-effective in the future as more constraints are likely to be placed on utilities that rely significantly on coal-fired generation." (Case No. 2010-00204, PSC Order September 30, 2010, p. 14; *see also* Case No. 2010-00222, PSC Order, February 17, 2011, p. 15; Case No. 2008-00408, PSC Order October 6, 2011, p. 22).

More recently and more explicitly, the Commission stated "with the potential for huge increases in the costs of generation and transmission as a result of aging infrastructure, low natural gas prices, and stricter environmental requirements, we will strive to avoid taking actions that might disincent energy efficiency." (Case No. 2012-00221, December 20, 2012, p. 11).

The Commission has demonstrated its interest in DSM programs by continuously monitoring Kentucky utilities' DSM efforts and requesting that Kentucky utilities keep the Commission apprised of all DSM program activities, both in Kentucky and in other jurisdictions where utilities have affiliates. (*See*, for example, Case No. 2012-00367, PSC Order, February 22, 2013, pp. 22-24; Case No. 2012-00051, PSC Order, May 30, 2012, p. 10; and Case No. 2010-00222, PSC Order, February 17, 2011, p. 15).

Q. What recommendations has the Commission Staff made recently with regard to the Companies' DSM programs?

A. In its report on the Companies' 2011 integrated resource plan, the Commission Staff encouraged "the Companies to continue to review new possible DSM/EE programs and seek ways to expand the current approved DSM/EE programs."[7]

Q. What conclusions do you draw from the Commission's orders and findings and the Commission Staff's recommendations on DSM programs, summarized above?

A. The Commission has been clear about the importance of DSM/EE resources, and that Kentucky utilities should constantly seek opportunities to improve upon and expand their DSM/EE programs.

Q. Is the Companies' proposed DSM/EE Plan consistent with this guidance from the Commission?

A. No. While the Companies have significantly increased DSM/EE in their service territories over the past ten years—as reflected in the increase in energy savings as a percent of retail sales—the proposed DSM/EE Plan would not continue this trend. Instead, it would result in almost no growth in savings relative to sales (from an estimated 0.56% in 2013 to 0.58% in 2015 and 0.58% in 2018). (Response to SC-1, Question No. 3; Response to SC-1, Question No. 6). The proposed DSM/EE Plan significantly understates the benefits available from DSM programs, includes an unwarranted reduction of some DSM programs, does not serve key customer types, does not include state-of-the art approaches in program designs, and does not increase program budgets in a significant way. I elaborate upon these points in my testimony below.

5. THE COMPANIES' ANALYSIS UNDERSTATES DSM/EE BENEFITS.

Current Programs are Highly Cost-Effective

Q. Which cost effectiveness tests did the Companies use to evaluate existing and potential DSM programs?

A. The Companies used four traditional DSM cost-benefit tests: the Participant test; the Ratepayer Impact Measure (RIM) test; the Total Resource Cost (TRC) test; and the Utility Cost test. (Direct Testimony of Michael Hornung, pp. 10-12). The Companies

[7] Staff Report on the 2011 Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company, p. 24, Case No. 2011-00140, March 2013.

presented the results of the four tests in their application, as required by a prior Commission order, and placed particular emphasis on the results of the Participant test and the TRC test. (*Id.*; Exhibit MEH-1, pp. 13-14).

Q. Please summarize the Companies' findings from their cost-effectiveness analysis.

A. The Companies' filing indicates that their proposed programs are highly cost-effective. Table 2 presents the key results from the cost-effectiveness analysis.

As indicated, the portfolio of programs is highly cost-effective from the perspective of the Participant test, with a benefit-cost ratio (BCR) of 8.7, and from the perspective of the TRC test, with a BCR of 3.1. Note that a BCR of 3.1 indicates that for every dollar spent in DSM resources, there will be a reduction in costs of three dollars.

Table 2. Overview of Cost-Effectiveness Results

	Participant	Utility	Ratepayer	TRC
Program Costs ($mil)	58	155	563	158
Program Benefits ($mil)	500	485	485	485
Net Benefits ($mil)	442	330	(78)	327
Benefit-Cost Ratio	8.66	3.13	0.86	3.07

(Sources: Benefit-cost ratios are from Hornung Direct Testimony p.12. Other benefits are from Exhibit MEH-1, Appendix C).

It is also useful to consider the net benefits in terms of cumulative present value dollars. As indicated in Table 2, the Companies' proposed DSM portfolio is expected to reduce TRC costs (*i.e.*, participant and utility costs) by $327 million, and to reduce the utility system costs by $330 million.

Q. Do you have any comments regarding how the Companies have applied the cost-effectiveness tests in their current proposal?

A. Yes. Although the tests, as applied by the Companies, show that the programs are cost-effective and a good deal for customers, the Companies have significantly understated the benefits of DSM programs. They have included the benefits resulting from avoided energy and avoided capacity costs, but they have ignored two important types of additional benefits: the avoided costs of complying with environmental regulations addressing greenhouse gas (GHG) emissions and participant non-energy benefits. I address each of these in turn below.

Q. You mentioned that the Companies' proposed DSM programs are all cost-effective, both according to the Participants test and the TRC test. Why is it important to recognize the benefits that are not accounted for in the Companies' DSM cost-effectiveness analyses?

A. There are several reasons why it is important to recognize the DSM benefits that are not currently accounted for by the Companies. First, it is important that the Commission have a complete understanding of the costs and benefits of the DSM programs. When making determinations as to whether to add, modify, expand or terminate DSM programs, the Commission needs this information in order to assess how well customers are being served, how much electricity costs are being reduced, and how much additional savings may be available from modifications to the Companies' proposed DSM/EE Plan.

Second, the Companies' estimates of the DSM costs and benefits are a critical component of the Energy Efficiency Potential Study that the Companies used to develop their DSM programs. If the DSM benefits are not fully captured, then the efficiency Potential Study will understate the opportunities available for energy efficiency programs. I address the efficiency Potential Study in more detail below.

Third, the Companies' estimates of the DSM costs and benefits are a critical component of the historic DSM program review. If the DSM benefits are not fully captured, then this analysis will underestimate the opportunities available for energy efficiency programs. I address the historical DSM program review study in more detail below as well.

Finally, it is important that the Companies and the Commission have a complete understanding of the costs and benefits of DSM programs for the purpose of future IRP and DSM planning dockets. Continued understatement of DSM benefits will lead to continued under-estimates of energy efficiency potential, and a continuation of programs and budgets that fail to capture cost-effective energy efficiency opportunities. If the Companies continue to systematically underestimate the benefits of energy efficiency, they will invest too much capital in supply-side resources (generation, transmission and distribution), and customers will pay more than necessary for their electricity services.

Avoided Costs of Complying with Environmental Regulations

Q. What are environmental compliance costs?

A. Environmental compliance costs are the costs of complying with current and future environmental regulations, including future CO_2 regulations. DSM can help reduce or avoid these costs.

Q. Power plants are subject to a variety of environmental regulations. Which regulations should the Companies consider when evaluating the costs and benefits of DSM programs?

A. Ideally, the Companies should use their best estimate of the value of avoiding the costs of complying with all current and reasonably anticipated future environmental regulations when screening DSM resources. Environmental compliance costs will be incurred by the Companies and eventually passed on to customers. Avoiding, or reducing, these environmental compliance costs through DSM programs will provide benefits to customers in terms of reduced utility system costs.

It is important to recognize that the costs of complying with environmental regulations are not the same as environmental damage costs, *i.e.*, health and environmental impacts that occur as a result of pollutants that are not abated through environmental regulations. The costs of compliance with environmental regulations are utility system costs, and therefore should be accounted for in the Participant test, the TRC test, and the Utility Cost test.

Q. Have the Companies properly accounted for avoided environmental compliance costs in their cost effectiveness screening?

A. No. The Companies have incorporated SO_2 , NOx and seasonal ozone allowance prices into their avoided energy costs estimates, recognizing that these allowance prices will affect the variable cost of electricity generation. However, the Companies have not included any cost associated with greenhouse gas (GHG) emissions in their avoided costs. (Response to SC-1 Question No. 12). Consequently, the Companies significantly understate the cost-effectiveness of their DSM programs.

Q. Is there uncertainty surrounding the extent and type of GHG requirements that might be imposed in the future?

A. Yes. However, uncertainties regarding future carbon regulations and the cost of complying with them should not be a reason for ignoring them. It is far better to use an informed estimate of the cost of compliance with reasonably-anticipated carbon regulations than to simply assume that they are equal to zero, a number that we know to be wrong. Many DSM resources have measure lives of 15 years, 20 years, or more. Supply-side resources have operating lives that are even longer. Resource decisions made in the near-term should be based on the best assumptions available about the conditions that will exist over these long time periods. Complying with future carbon regulations is clearly a condition that will affect electricity costs over the time period of interest in this case. Many utilities in the US include estimates of the costs of CO_2 in their resource planning analyses, despite the uncertainty regarding those costs.[8] The Companies should include these costs in evaluating the cost-effectiveness of DSM measures here.

Q. Have the Companies used CO_2 costs in other resource planning proceedings?

A. Yes. In Case No. 2014-00002, a pending docket in which the Companies have applied for a certificate of public convenience and necessity for a new natural gas combined cycle plant and a new solar photovoltaic facility, the Companies considered a CO_2 price in six of the twelve scenarios used in evaluating resource options. (*See* Case No. 2014-00002, Exhibit DSS-1, p. 15, Table 9). The carbon prices used by the Companies start in 2020 at $23 per short ton, increase to $59 per short ton by 2030, and to $107 per short ton by 2040. These estimates are based on the mid-case carbon price forecast prepared by colleagues of mine at Synapse Energy Economics.[9] (*See* Case No. 2014-00002, Exhibit DSS-1, p.14, Table 8).

[8] Synapse Energy Economics, Inc., *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for 'Other Program Impacts' and Environmental Compliance Costs*, prepared for the Regulatory Assistance Project, November 2012, ("Synapse, *Energy Efficiency Cost-Effectiveness Screening*"), available at http://www.synapse-energy.com/Downloads/SynapseReport.2012-11.RAP.EE-Cost-Effectiveness-Screening.12-014.pdf.

[9] Synapse Energy Economics, 2012 Carbon Dioxide Price Forecast (Oct. 4, 2012), available at http://www.synapse-energy.com/Downloads/SynapseReport.2012-10.0.2012-CO2-Forecast.A0035.pdf.

Q. Has the Commission Staff recently provided the Companies with guidance on this issue?

A. Yes. The Commission Staff's report on the Companies' 2011 IRP addressed the issue of accounting for environmental compliance costs in resource planning. The Staff agreed with the Environmental Groups in that case that the exclusion of CO_2 costs from the IRP was a shortcoming. The Staff report went on to say that:

> [T]he Commission expects that environmental compliance planning be performed comprehensively, considering not only existing and pending regulations, but also those reasonably anticipated, including, but not limited to CO_2. Comprehensive planning is essential in ensuring that compliance measures proposed be implemented and to allow the Commission adequate time to perform its statutory duties in determining that new facilities and modifications are necessary in order to provide safe and adequate service, and that the rates charged are fair, just, and reasonable.[10]

Q. Do you recommend that the Companies include CO_2 allowance prices when screening their DSM programs?

A. Yes. I recommend that the Companies use the best available estimates of future CO_2 allowance prices when screening their DSM programs. At this time, the best available estimates of CO_2 allowance prices are those used by the Companies in Case No. 2014-00002.

Q. Would including CO_2 allowance prices materially affect the benefits (*i.e.*, the avoided costs) of DSM programs?

A. Yes, I believe it would. The extent to which a CO_2 allowance price will affect avoided costs depends upon the CO_2 emission rate of the marginal power plant at any one point in time. Below I present two examples of the likely impact of the cost of electricity generation (in $/MWh) of CO_2 allowance prices. In both examples, I start with a carbon price of $23 per short ton in 2020.

- In the case where the marginal power plant is coal-fired, with a CO_2 emission rate of 0.98 tons/MWh, then the additional cost of the CO_2 allowance price will be roughly $22/MWh.

[10] Staff Report on the 2011 Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company, p. 41. Case No. 2011-00140, March 2013.

- In the case where the marginal power plant in any one hour is a gas-fired combined cycle plant, with a CO_2 emission rate of 0.66 tons/MWh, then the additional cost of the CO_2 allowance price will be roughly $15/MWh.[11]

Conducting a more detailed estimate of the likely impact on electricity generation costs of the forecasted CO_2 allowance prices is beyond the scope of my testimony. Nonetheless, it is very likely that in 2020 a CO_2 allowance price of $23 per short ton will increase electricity generation costs by roughly $15MWh to $22/MWh, given the frequency with which either coal-fired or gas-fired power plants are likely to be on the margin of the Companies' system. Furthermore, using the same methodology, in 2030 a CO_2 allowance price of $59 per short ton will likely increase electricity generation costs by roughly $39/MWh to $58/MWh.

In sum, a proper accounting of the avoided cost of complying with future federal CO_2 regulations will significantly increase the benefits of the Companies DSM programs. These additional benefits should be included in three of the tests that the Companies use to screen DSM, including the Utility Cost test, RIM test, and TRC test, because these benefits help reduce electricity system costs, and electricity system costs are the foundation of these three tests.

Participant Non-Energy Benefits

Q. Turning to the second category of benefits that you believe the Companies ignored, what are non-energy benefits?

A. Non-energy benefits (NEBs) are those costs and benefits that are not part of the costs, or avoided costs, of the energy provided by the utility that funds the efficiency program. In addition, DSM resources also provide "other fuel savings," which are the savings of fuels that are not provided by the utility that funds the efficiency program.[12]

There is a wide range of NEBs associated with DSM programs. NEBs are categorized by the perspective of the party that experiences the impact: the utility, the participant, or society at large.

[11] Both the coal and gas emission rates are taken from EPA's Clean Air Markets Division, Air Quality Markets Dataset (AQMD).

[12] Synapse, *Energy Efficiency Cost-Effectiveness Screening* at 3.

- Utility-perspective NEBs are indirect costs or savings to the utility and its ratepayers, and include impacts associated with financial accounting, customer service, and safety. Utility-perspective NEBs should be included in three of the DSM screening tests used by the Companies, including the Utility Cost test, RIM test, and TRC test, because these benefits affect utility system costs.

- Participant-perspective NEBs include water savings, reduced equipment cost, improved equipment performance, increased health and safety, increased comfort, economic stability, improved worker productivity, and improved student productivity. Participants can also experience benefits in terms of "other fuel savings," *i.e.*, when gas, oil or other fuels are saved as a result of an electric efficiency program. While many of these participant-perspective NEBs are relevant to both low-income and non-low-income customers, they tend to be more significant for low-income customers. Participant-perspective NEBs should be included in the Participant and the TRC tests, because these benefits accrue to DSM program participants.

- Societal-perspective NEBs are indirect program effects that accrue to society at large beyond those realized by utilities, their ratepayers, or program participants, and include impacts on the environment, economic development, and healthcare costs. Societal-perspective NEBs should be included in the Societal Cost test, but not in the four tests used by the Companies to screen DSM programs.

In this testimony, I focus on participant-perspective NEBs, because (a) these can be quite large and make a significant difference in cost-effectiveness, and (b) the Companies place particular emphasis on the Participant and TRC tests, which should include participant NEBs.

Q. Did the Companies include non-energy benefits in the cost-effectiveness screening?

A. No. The Companies did not include participant non-energy benefits in their analysis. (Response to SC-2, Question No. 3(d)). Consequently, they have significantly understated the benefits of their DSM programs.

Q. Why is it so important to include participant NEBs when applying the TRC test?

A. One of the distinguishing features of the TRC test is that it includes the costs of a DSM program to both the utility (or program administrator) and the customer (or program participant). Given that the test includes all participant costs, it is necessary to also include all participant benefits, including both energy benefits and non-energy benefits. Otherwise, the TRC test will be internally inconsistent, and will provide results that are skewed against energy efficiency resources.

Q. Are participant non-energy benefits certain enough to use when screening energy efficiency programs?

A. While there is some uncertainty regarding the magnitude of some participant NEBs, there is no question that they can be quite large, and that they will have a significant impact on energy efficiency cost-effectiveness under the TRC test. There are several ways to address the uncertainties associated with participant non-energy benefits, and it is better to use an informed estimate of NEB values than to simply assume that they are equal to zero, a number that we know to be wrong. Furthermore, it is important to recognize that there is considerable uncertainty regarding many of the assumptions for the future costs and benefits of demand-side and supply-side resources. There is no reason to hold participant NEBs to a higher standard of certainty than these other costs and benefits.

Q. Do other states include participant NEBs when screening DSM resources?

A. Yes, many states that use the TRC test include some form of participant NEBs when screening DSM programs, and I recommend that the Companies do so as well. However, many other states that use the TRC do not include participant NEBs when screening DSM programs.[13] There is increasing interest among efficiency experts and stakeholders in improving the way that states account for NEBs when screening energy efficiency resources.[14]

[13] Synapse Energy Economics, *Best Practices in Energy Efficiency Program Screening: How to Ensure that the Value of Energy Efficiency is Properly Accounted For*, prepared for the National Home Performance Council, July 2012, p.3..

[14] National Efficiency Screening Project, *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening*, March 28, 2014, p.5.

Q. Of those states that include participant NEBs when screening DSM resources, what methods do they use?

A. Some states (*e.g.*, California, Massachusetts, Oregon, and Washington) require the use of quantitative analyses to estimate participant NEBs in monetary terms. Some states use rough proxy adders to avoided costs to account for NEBs. For example, Vermont requires the use of a 15 percent adder to reflect participant NEBs for all DSM programs, and another 15 percent adder to reflect additional NEBs that result from low-income DSM programs. Similarly, Colorado uses a 10 percent adder for all programs, and an additional 10 percent adder for low-income programs. Other states (*e.g.*, New York) require that NEBs be used for informational purposes, and that the cost-benefit results be presented using a range of NEBs, from zero to 50 percent to 100 percent of NEBs. I am aware of several states that are currently investigating ways to improve or otherwise update their application of participant NEBs, including California, Maryland, New York, Oregon, and Washington.

Q. What impact do participant NEBs have on cost-effectiveness testing?

A. Studies that have placed values on non-energy benefits have shown that they can be quite large, and can significantly impact cost-effectiveness results. For example, Massachusetts has commissioned two studies that quantify non-energy impacts to both residential and commercial and industrial (C&I) customers. Based on these studies, and combined with other fuel savings associated with natural gas, oil, propane, and water, Massachusetts has accounted for NEBs more completely than any other state that I am aware of. [15] If the specific NEB values used in Massachusetts for each program were converted into a proxy adder on top of avoided costs, they would result in adders equal to 45 percent for residential programs, 57 percent for low-income programs and 23 percent for commercial and industrial programs. Applying adders like these to the Companies' DSM programs would indicate that the benefits of those programs are significantly greater than the benefits estimated by the Company.

[15] Synapse, *Energy Efficiency Cost-Effectiveness Screening.*

Weights Applied to Different Screening Tests

Q. Do you have any comments regarding the way that the Companies emphasize the results of the Participant test and the TRC test?

A. Yes. Based on my findings above, as well as my experience with energy efficiency cost-effectiveness analyses in other states and nationally, I recommend that the Companies modify the way they consider the results of the different DSM screening tests. Specifically, I recommend that the Companies reduce the weight they give to the TRC (as currently administered) and Participant cost tests and give considerable weight to the Utility Cost test.

Q. Why do you recommend that the Companies give little weight to the results of the TRC test as they currently administer it?

A. As described above, the Companies do not account for the participant NEBs when applying the TRC test. Since the TRC test includes all participant costs, it is necessary to also include all participant benefits, including both energy benefits and non-energy benefits. Otherwise, the TRC test will be internally inconsistent, and will provide results that are skewed against energy efficiency resources. Absent the improvements I identified earlier in my testimony, I recommend that the Company reduce its focus on the TRC test.

Q. Why do you recommend that the Companies give considerable weight to the results of the Utility Cost test?

A. The Utility Cost test provides the simplest, most direct estimate of the likely cost impacts of energy efficiency on customers. It includes only those costs incurred by the utility and those costs avoided by the utility, and therefore it provides the best indication of the impacts on utility revenue requirements. The impacts on utility revenue requirements provide the best indication of the impact on all customers in total, in terms of utility system costs. In my view, the results of the Utility Cost test provide the most meaningful indication of the electricity system cost impacts, relative to the RIM test, the Participant test, and the TRC test.

Q. Do the results of the Utility Cost test indicate that the Companies' energy efficiency programs are cost-effective?

A. Yes, the results of the Utility Cost test indicate that the proposed energy efficiency programs are cost-effective. As indicated in Table 2 above, the results of the Utility Cost test indicate that the programs will reduce electricity system costs by roughly $330

million dollars. In addition, if the Companies were to properly account for the cost of compliance with environmental regulations, then these electricity cost savings would be even greater.

Q. Why do you recommend that the Companies give little weight to the results of the Participant test?

A. The Participant test provides some useful information about the extent to which customers will benefit from participating in the energy efficiency programs. It can also provide some useful information about how to design customer incentives, and how to market programs to customers.

However, for the purpose of screening energy efficiency programs, the Participant test is of less value than either the TRC test or the Utility Cost test. Participants almost always benefit from energy efficiency programs. It is very rare to find a well-designed energy efficiency program that does not pass the Participant test. Also, when setting goals and budgets for energy efficiency programs, it is important to consider the impacts on more than just the program participants. Both the Utility Cost and the TRC tests provide better indications than the Participant test of the impacts of energy efficiency on the utility system as a whole.

Q. Do you have any recommendations with respect to the RIM test?

A. I agree with the Companies' decision not to emphasize the RIM test and do not believe that a score of below 1.0 on this test should preclude a program from being approved. In my opinion, no weight should be given to the RIM test. Despite its name, the RIM test does not provide an adequate analysis of the rate and bill impacts that result from energy efficiency resources. There are several reasons for this.

First, the primary difference between the Utility Cost test and the RIM test are the "lost" revenues, *i.e.*, those revenues that are not collected through rates due to reduced sales from DSM programs. It is critical to recognize that these lost revenues are not a "new" cost created by the energy efficiency programs. Rate increases to recover lost revenues are simply a result of the need to recover existing costs spread out over fewer sales. The existing costs that are recovered through rate increases as a result of lost revenues from energy efficiency are (a) not caused by the efficiency program, and (b) are not a new, incremental cost. In economic terms, these existing costs that require rates to increase as

a result of lost revenues are "sunk" costs. Sunk costs are not included in cost-effectiveness analyses; only future costs and benefits are included. Therefore, lost revenues should not be included in energy efficiency cost-effectiveness analyses.

Second, the RIM test does not provide useful information about what happens to rates as a result of program implementation. A RIM test benefit-cost ratio of less than one indicates that rates will increase (all else being equal), but says little to nothing about the magnitude of the rate impact, the effect on customer bills, the portion of customers that are likely to experience higher bills versus lower bills, the extent to which bills might go up or down, and other information necessary to consider this issue properly.

Third, a strict application of the RIM test can result in the rejection of large amounts of energy savings and the opportunity for large reductions in many customers' bills in order to avoid what are often small impacts on customers' bills.

Finally, applying the RIM test to screen efficiency programs will not result in the lowest cost to customers, and it likely will result in missed opportunities for the utility to reduce costs, reduce risks, improve reliability, reduce customer bills, and ultimately provide customers with a set of services to best meet their electricity needs.

Q. Should rate and bill impacts be considered as part of energy efficiency cost-effectiveness analyses?

A. Although the rate and bill impacts of energy efficiency programs are important and should be considered, these impacts are not a part of cost-effectiveness analyses. Instead, they are a matter of customer equity between (a) program participants that experience reduced bills and (b) non-participants that experience increased rates and therefore increased bills.

Q. If rate impacts are not a matter of cost-effectiveness, how should they be analyzed when planning DSM programs?

A. Rate, bill and participation impacts of the DSM programs should be comprehensively analyzed in terms that are meaningful for decision-makers, such as percent increase in rates, percent reduction in bills, and percent of customers who participate. I recommend that the Companies provide these metrics in future DSM filings.

Q. Are there other options available to mitigate concerns about rate impacts, besides rejecting DSM programs or constraining DSM budgets?

A. Yes, there are many options, all of which are better than simply reducing the size of or eliminating cost-effective DSM programs. These options include, for example: modifying program designs to reduce program costs; ensuring that all customers have access to programs so that they have opportunities to reduce their bills; including new programs that are more likely to reduce rates than increase them (*e.g.*, demand response programs); designing programs to mitigate undue repeat participants and maximize new participants; marketing and delivering programs in a way that targets and serves hard-to-reach customers; and increasing DSM program budgets to increase the number of participants, thereby mitigating customer equity concerns.[16]

6. THE COMPANIES SHOULD CONTINUE TO OFFER THE PROGRAMS THAT ARE SET TO EXPIRE AND SHOULD EXPAND THE BUDGETS OF THE PROPOSED MODIFIED PROGRAMS.

Q. Please describe the program expirations, changes, and addition proposed by the Companies in the current filing.

A. As a part of the DSM/EE Plan, the Companies are proposing to allow several programs to expire at the end of 2014. These include the following:

- Residential High Efficiency Lighting.
- Residential New Construction.
- HVAC Tune-up.
- Dealer Referral Network.

The DSM/EE Plan also outlines proposed modifications to existing programs. These proposals include the following:

- Commercial Load Management - move the large commercial load management effort to full commercial deployment and modify financial incentives to encourage customers to participate.

[16] *Analyzing and Managing Bill Impacts of Energy Efficiency Programs: Principles and Recommendations*, the State and Local Energy Efficiency Action Network, July 2011, p.4.

- Residential Incentives Program - increase budget to allow for higher-than-anticipated demand.
- Commercial Conservation/Commercial Incentives - eliminate on-site commercial audits, develop existing online audit tool and add new special purpose tools, add new construction rebates, and lower incentive amount from $2.0 million to $1.5 million.
- Customer Education - increase funding, offer training for home construction professionals, and extend through 2018.
- Residential Conservation Program - add a multi-family incentive tier.

In addition to the proposed modifications described above, the Companies are seeking to implement a new program, Advanced Metering Systems.

Finally, the Companies are not proposing to make any modifications to Program Development and Administration, Smart Energy Profile, Residential Load Management/Demand Conservation, Residential Refrigerator Removal, and Residential Low Income Weatherization programs.

Programs Set to Expire

Q. Why are the Companies proposing to allow the Residential High Efficiency program to expire?

A. The Companies' decision to allow the Residential High Efficiency Lighting Program to expire is primarily based on the pending federal lighting standards, which will decrease the amount of savings that the Companies can claim due to Compact Fluorescent Lights (CFLs), and the allegedly "cost prohibitive nature of residential LED technologies." (Exhibit MEH-1, p. 53).

Q. Why are you concerned with the Companies' proposal to allow the Residential High Efficiency Lighting program to expire?

A. This program is currently very cost effective according to the TRC test, with a BCR of 3.4 based on actual results through November 2013. As I discuss in Section 8, the DSM Potential Study does not account for some significant benefits of DSM, and as a result, the benefit-cost ratio of 3.4 is too low. While pending federal lighting standards will put

downward pressure on this BCR during the 2015 to 2018 timeframe, I believe that Cadmus overstated the reduction to efficiency potential, because Light Emitting Diode (LED) bulbs were screened out and not considered in the Potential Study analysis.

Note that the Companies estimate that their residential customers still use inefficient incandescent bulbs in as much as 80 to 85 percent of their sockets. (Response to SC-1, Question No. 15(d)). This indicates that there is an enormous potential for improving the efficiency of residential lighting, particularly if LED lighting options are considered. Also, note that in its Evaluation Report, Navigant Consulting, Inc. recommended that the Companies "examine other program offerings beyond general service, screw-type CFLs in order to maintain current efficiency thresholds as well as consider lamp types not currently regulated at the Federal level." (Response to KPSC-2, Question No. 5).

Moreover, the Companies failed to consider the breadth of delivery mechanisms and incentive designs that are commonly and successfully implemented in the industry, such as mid-stream incentive mechanisms (discussed further below). This is particularly true with respect to residential high efficiency lighting, for which mid-stream incentive mechanisms could reduce the transaction costs associated with the direct mail delivery mechanism currently being used for the Residential High Efficiency Lighting Program.

Rather than letting the Residential High Efficiency Lighting program expire, I believe the Companies should continue to offer it after 2014.

Q. Why are the Companies proposing to allow the Residential New Construction program to expire?

A. The Companies propose to allow the Residential New Construction program to expire in 2014 "[d]ue to the achieved program impact coupled with the increased requirements for homes to earn the ENERGY STAR label set forth by the U.S.[EPA]." (Exhibit MEH-1, p. 55). In the DSM Program Review, Cadmus notes that "[b]uilders in the Company's territory, along with those in many other areas around the country, find the new version of ENERGY STAR New Homes complicated and expensive." (Exhibit MEH-2, p. 20).

Furthermore, Cadmus questions whether the New Construction program can be cost effective under IECC 2009, which Kentucky adopted in 2013. (*Id.*).

Q. Do you agree that the Residential New Construction program should be allowed to expire?

A. No. The Companies have not considered alternative program designs of continuing to offer incentives for new construction meeting other standards such as LEED, or offering incentives based on a hybrid of standards for energy efficient new construction. (Response to SC-2, Question No. 21). Furthermore, the omission of key benefits in the cost effectiveness test may have led to the finding that the new construction program would not be cost effective with the update in Kentucky codes. The BCR for this program, based on actual results through November 2013, is 2.8 based on the TRC test. However, as with the Residential High Efficiency Lighting program, this number is too low given the failure to account for all benefits. Finally, new construction programs in general address a very important need for efficiency services, and ignoring this need can result in significant lost opportunities and higher electricity costs over the long-term (it is much less expensive to make a building efficient at the time of construction than to retrofit it later.)

Q. Why are the Companies proposing to allow the Residential and Commercial HVAC Diagnostic and Tune-Up and Dealer Referral Network programs to expire?

A. The Companies experienced low participation in the Residential and Commercial HVAC Diagnostic and Tune-Up program due to HVAC service providers apparently competing with the program by offering long-term contracts. The Companies made efforts to adjust the program design to try to increase program effectiveness and participation; for example, they streamlined the program to include only one visit to the home, rather than two. (Exhibit MEH-1, p. 56).

The Companies propose to allow the Dealer Referral Network to expire, because its primary function is to support the HVAC Tune-up and Residential New Construction programs. (Exhibit MEH-1, p. 59).

Q. Do you agree that the HVAC Tune-up Programs should be allowed to expire?

A. No. This type of service has been found to be successful by other utilities, and to provide significant cost-effective efficiency savings for participating customers. In addition, I expect that there are opportunities for the Companies to work with the HVAC service providers, rather than competing with them, in order to ensure that they are providing

state-of-the-art, high-efficiency tune-up services. Furthermore, the Companies have significantly understated the benefits of their energy efficiency programs, as described in Section 5. If the Companies account for the full benefits of this program, they would likely find that it is cost-effective.

Q. Do you agree that the Dealer Referral Network program should be allowed to expire?

No. The Dealer Referral Network program can provide significant assistance in overcoming a key barrier that inhibits customers from adopting cost-effective efficiency measures. If the Residential New Construction and HVAC tune-up programs are retained, then the rationale for allowing the Dealer Referral Program to expire is no longer valid, and it should continue as well.

Program Modifications

Q. Please describe the Companies' proposed change to the Commercial Load Management program.

A. The Companies recommend shifting the focus of the program to incorporate a new market segment (large commercial customers). According to the Companies, "due to the success of the [large commercial] program in the short timeframe, more focus will be placed on the large commercial program." (Response to SC-1, Question No. 14). The Companies propose keeping the existing budget constant, which essentially means that the program will no longer cater to small commercial customers. Although the Companies have said that small commercial customers can participate, "[t]he Companies are requesting that going forward in years 2015-2018 that the small commercial installations will be assumed as being zero ...." (Response to AG-2, Question No. 9).

Q. Do you agree with the Companies' proposal?

A. Not as presented. While I support the Companies' efforts to incorporate large commercial customers, I do not believe that small commercial customer installations should be eliminated. This program is cost-effective and offers significant benefits for the small commercial customer segment that should continue. (Exhibit MEH-1, Appendix C). Rather than shifting the existing budget from small to large customers, the Companies should consider at least maintaining existing budgets for the small commercial segment, and adding additional funds to support participation by the large commercial group,

resulting in an overall increased budget to support this cost-effective program for both small and large commercial customers.

Q. What is the Companies' proposal for modifying the Commercial Conservation/Commercial Incentives Program?

A. The Companies are proposing several modifications to the existing program. First, the Companies recommend eliminating on-site commercial audits, although commercial customers who independently arrange for their facilities to be audited will be able to apply for rebates from the Companies on measures installed pursuant to the recommendations of the audit. (Exhibit MEH-1, p. 32).

Second, the Companies propose to further develop their existing online audit tool "using the commercial customer's actual 12-month usage history, if available, to enhance the ability to recommend measures that will be optimal to the unique needs of the commercial customer." Furthermore, the Companies plan to add new special purpose tools for lighting, HVAC, and motor and pumps. (Response to KPSC-1, Question No. 20).

Third, the Companies seek to add new construction rebates, which will be based on how much the new building exceeds code and meets various LEED-certification designations. (Response to KPSC-1, Question No. 20).

Fourth, they propose to lower the incentive amount from $2.0 million to $1.5 million, consistent with their proposal to lower their current annual commercial demand target from 20 MW to 15 MW. (Response to KPSC-1, Question No. 20). The justification provided for this change is the findings of the Cadmus Potential Study regarding the "realization of fewer economic and achievable measures due [to] the current market conditions and costs." (Exhibit MEH-1, p. 30).

Q. Do you think that the budget should be held at current levels?

A. No. The Companies are proposing to include an additional component in this program targeting new construction. In addition, the budget for the existing program components should be maintained for the following reasons:

- The shift to an online audit tool does not appear to be supported by Cadmus's recommendations. According to the Program Review,

> Cadmus found that very few utilities offer an online commercial audit program component…. Because significant variables exist within commercial construction, the online tool can be complicated to use and results offer limited customizability and generic recommendations.

(Exhibit MEH-2, p. 43).

It is not at all clear that the online tool enhancements recommended by the Companies will be able to simultaneously address the need for customizability for unique building and energy use characteristics on the one hand, and ease of use on the other. If the online tool does not meet customers' needs, then customers will either not have an audit (which is not a preferable outcome) or schedule an audit independently. To the extent that they arrange for an audit independently and apply for a rebate, the revised program may experience similar expenses as under the existing structure.

- The existing program has gained traction recently, realizing its $2 million spending target in 2013 for the first time. (Exhibit MEH-2, p. 40). This momentum suggests that the market could support current budget levels for the existing program components.

- The rationale for lowering the commercial incentive amount from $2.0 million to $1.5 million rests on the findings of the Potential Study, which was critically flawed as discussed in Section 8 of this testimony.

Thus, I recommend that the Companies expand the proposed budget ($13.5 million over four years) by an additional increment for the new construction component, based on a reasonable projection of new construction participation.

Q. What is the Companies' proposal for modifying the Residential Conservation Program?

A. The Companies propose to add a multi-family incentive tier to the existing program design. As with the Commercial Load Management program, the Companies seek to shift the focus of the program to incorporate a new market segment (multifamily units) within the existing budget rather than increasing the budget. (Exhibit MEH-1, pp. 39-42).

Q. Do you agree with the Companies' proposal?

A. No. While I support the Companies' proposal to add the multi-family tier, I recommend that the program budget be increased to maintain the existing level of support for single family units while increasing funds to support participation by multifamily units. The Residential Conservation Program is highly cost-effective and offers significant benefits to a large and important portion of the Companies' customers. (Exhibit MEH-1, Appendix C).

Q. What is the Companies' proposal for modifying the Residential Incentives and Customer Education Programs?

A. The Companies propose to increase the budgets for these programs to (i) meet high demand and prevent early termination of the Residential Incentives Program, and (ii) continue to educate its customers about the benefits of energy efficiency and encourages program participation through the Customer Education Program. (Exhibit MEH-1, pp. 25, 35).

Q. Do you support the Companies' proposal to increase the budgets for these programs?

A. Yes. It is especially important to increase the budget for the Residential Incentives program, as this will lead to direct and immediate energy savings.

<u>New Program: Advanced Metering Systems</u>

Q. Have the Companies included any new programs in this DSM/EE Plan?

A. Yes, they have included the Advanced Metering System (AMS) program for the first time.

Q. What is the proposed AMS program?

A. The Companies propose to allow up to 10,000 customers to elect to have advanced meters installed, which will allow these customers to access enhanced energy usage information through a website. (Testimony of David E. Huff, p. 3, lines 11-15). Participants will not get immediate feedback on energy usage; they will only be able to access prior days' hourly usage within 48 hours. (Response to AG-1, Question No. 8).

Q. Why are the Companies proposing an AMS program?

A. The Companies are proposing the AMS program in order to "put in place the communications and control infrastructure necessary for possible future advanced-meter deployments, as well as to provide participating customers more detailed information about their consumption." (Testimony of David E. Huff, p. 5, lines 13-16).

Q. Do you have any concerns with the Companies' proposed AMS?

A. I have not reviewed the Companies' AMS proposal in much detail; such a review is outside the scope of my testimony. However, I wish to point out that the Companies' activities and budgets related to AMS should be incremental to those of the DSM/EE programs. In other words, the DSM/EE programs and budgets should not be reduced or curtailed in order to make room for AMS activities. While there is some overlap between the two types of activities, the DSM/EE programs offer distinct and significant benefits to customers, and should be implemented in a way to maximize those benefits. AMS activities offer different benefits, have different costs, and different cost-effectiveness implications, and therefore should be planned for and treated separately.

Perhaps most significantly, energy savings are not directly attributable to the installation of AMS. The Companies describe the relationship between AMS and energy savings as follows:

> Any potential energy savings are based on the propensity of customers modifying their energy usage behavior. Data from the AMS is for the benefit and education of customers, and provides information related to patterns of energy usage and does not directly affect any given load at the customer's premise. Customers may be able to correlate usage with behaviors, events, or appliances even if the information is not real time.

(Response to AG-2, Question No. 8). Furthermore, it is worth noting that the Companies did not screen AMS for cost-effectiveness, as it did with the other programs.

DSM/EE Program Scale and Budgets

Q. Do you have any concerns about the scale of the DSM programs in general?

A. Yes. In general, the Companies' DSM/EE program budgets are smaller than they should be, particularly in light of the success the Companies' programs have had. As noted

above, the programs are highly cost-effective and are serving customers well. Expanding the program budgets would allow the Companies to achieve even more savings and greater benefits for customers. Expanded budgets would also allow the Companies to increase the number of program participants, thereby ensuring that a larger portion of customers will experience reduced electricity bills. Furthermore, as discussed in Section 4, the Commission has encouraged the Companies to seek opportunities to expand their DSM programs. This DSM/EE Plan presents such an opportunity.

Q. Do you have specific recommendations for expanding program budgets?

When considering expanded budgets, the Companies should focus on those programs that are best suited to serve the most important customer types. For this purpose, I recommend that the Companies focus on expanding budgets for the following:

- The Residential Low Income Weatherization / WeCare Program, because low-income customers are an important subset of customers and experience greater energy burdens and have fewer opportunities to implement efficiency measures on their own.
- The Residential Conservation / Home Energy Performance Program, because it provides a large portion of residential customers with the opportunity to achieve significant energy savings in their homes.
- The Commercial Conservation / Commercial Incentive Program, because it provides a large portion of commercial customers with the opportunity to achieve significant energy savings for their businesses.

7. THE COMPANIES SHOULD OFFER INDUSTRIAL PROGRAMS.

Q. Why do the Companies not offer DSM programs to industrial customers?

A. The Companies state that they do not offer DSM programming to the industrial sector because of the provisions in Kentucky law that allow industrial customers to implement their own DSM measures and thereby avoid paying a charge for the Companies' DSM programs. (KRS 278.285(3)). The Companies also claim that "sufficient interest is not present to make programming economical." (Response to SC-1, Question No. 17).

Q. Do you agree that the Companies should not offer industrial customers DSM programs because these customers have the option to implement DSM measures on their own?

A. No, I do not agree. The Companies should offer DSM programs to their industrial customers for several reasons.

First, the Kentucky DSM law does not preclude any utility from offering an Industrial DSM program. While I am not an attorney and am not offering a legal opinion, it appears to me that the law presumes that utilities will offer industrial customers DSM programs by stating that "the commission shall allow individual industrial customers with energy intensive processes to implement cost-effective energy efficiency measures *in lieu of* measures approved as part of the utility's demand-side management programs…" (KRS 278.285(3)) (emphasis added). Indeed, some Kentucky utilities currently offer DSM programs to their industrial customers.[17]

Second, the Companies' most recent survey of industrial customers shows widespread interest in participating in DSM programs from the Companies. In 2012, the Companies distributed a questionnaire to industrial customers to gauge attitudes toward potential DSM offering from the Companies. (Response to SC-2, Question No. 8, Attachment). Many industrial customers responded that they would probably participate in a utility DSM program; few customers indicated they would definitely opt out.

Third, the Companies should provide DSM services to all of their customers, including industrial customers, in order to offer them one of the best means of reducing their electric bills and to lower overall system costs for the benefit of all consumers. Some industrial customers may not have the technical expertise or the wherewithal to implement DSM measures on their own, but would be very interested in obtaining assistance from the utilities to do so. Denying these customers this option is unfair to them, and limits the extent to which the Companies can implement DSM resources to reduce costs for all customers.

Fourth, the Companies' approach is inconsistent with industry practice. In several states that have provisions similar to Kentucky's statute allowing industrial customers to opt-

[17] EKPC, TVA, and Big Rivers offer industrial energy efficiency programs in Kentucky, and include program costs into their base rates. *See* SEE KY Action Plan at p. 38.

out (or to self-direct their programs), utilities offer industrial customers efficiency programs. For example, even though North and South Carolina have opt-out provisions for industrial customers, Duke Energy Progress (a major utility there) has offerings for industrial customers, including technical assistance and financial incentives for new construction and retrofits.[18,19] Utilities in Ohio, Texas and others have opt-out or self-direct provisions as well as industrial DSM programs. Many of these utilities have a goal of offering efficiency programs that are so well tailored to industrial customers' needs that the customers prefer not to opt-out of them. For example:

> In Wisconsin, where industrial efficiency programs have historically been quite strong, no single customer has chosen to take advantage of the self-direct program. Wisconsin's policy-makers and administrators of the [cost-recovery mechanism or] CRM-funded programming attribute the lack of interest in the self-direct option to industrial companies' perceptions that Wisconsin's Focus on Energy Programs serve them well and provide benefits equal to or greater than their individual CRM fees.... In Oregon, companies have increasingly stopped using the self-direct program and instead chose to pay into the CRM-funded programming offered through the Energy Trust of Oregon. Customers have noted that they made the switch to take advantage of the Energy Trust's incentives and technical assistance.

(Ex. TW-3, p. 17).

Finally, the industrial sector is critical to Kentucky's economy; therefore, the Companies should help industrial customers reduce their costs and improve their cost competitiveness through energy efficiency. By not including Industrial DSM programs, the Companies fail to provide this important service to customers that make up roughly 30 percent of their load.

Q. Do you think there are likely to be cost-effective DSM opportunities for industrial customers in Kentucky?

A. Yes. The industrial sector is generally very energy intensive. This sector accounts for a substantial portion of the Companies' annual energy sales—approximately 30 percent. (Response to SC-1, Question No. 17). Moreover, industrial energy efficiency generally

[18] *See* https://www.progress-energy.com/carolinas/business/save-energy-money/energy-efficiency-for-business.page?

[19] Chittum, Anna. 2011. Follow the Leaders: Improving Large Customer Self-Direct Programs. p. 10. Attached as Exhibit TW-3.

has the most cost effective potential out of all of the sectors. Industrial efficiency resources are half the cost of resources in other sectors, in terms of dollars per kWh saved.[20]

Finally, although the Companies did not provide an estimate of industrial-sector energy efficiency potential in their service territories, I am aware of an earlier state-wide analysis that did consider this sector. In 2007, the Governor's Office of Energy Policy released a study entitled "An Overview of Kentucky's Energy Consumption and Energy Efficiency Potential," prepared by Kentucky Pollution Prevention Center and the American Council for an Energy-Efficient Economy (State-Wide DSM Potential Study), attached here as Exhibit TW-4. This study evaluated achievable energy efficiency potential for the residential, commercial, and industrial sectors in Kentucky. The study assessed and combined all energy savings potential including electricity and natural gas, but presented electricity savings separately for the industrial sector. The total achievable electricity savings potential for the industrial sector under the "moderately aggressive" scenario is estimated to be 26 percent in 2017. (State-Wide DSM Potential Study, p. 18). In the industrial sector, the study estimated significant amounts of electric efficiency potential available from pumps, motors, sensors/controls, fans, compressed air, lighting, and energy information systems. (State-Wide DSM Potential Study, p. 19).

Q. What is your recommendation regarding Industrial DSM programs for the purpose of this docket?

A. I recommend that the Companies begin providing industrial customers with energy efficiency services as soon as is practical within the 2015 to 2018 period. This could be accomplished fairly easily during this period by expanding the Commercial Conservation program to provide tailored services to industrial customers.

Furthermore, the Companies' future DSM potential studies should estimate the potential efficiency savings available from the industrial sector, to provide the Companies and the Commission with an indication of the opportunities available from this important sector. Finally, future DSM/EE Plans should include a detailed description, analysis and proposal for Industrial DSM programs.

[20] Chittum, Anna. 2011. Follow the Leaders: Improving Large Customer Self-Direct Programs. p. 5.

8. THE ENERGY EFFICIENCY POTENTIAL STUDY IS UNDULY LIMITED.

Overview of the EE Potential Study

Q. Why did the Companies include an efficiency potential study in their application?

A. The Companies filed the Potential Study pursuant to a prior Commission order, which directed the Companies to conduct a study in their service territories to determine the potential for additional demand and energy savings through DSM/EE. (Joint Application, p. 6). The Companies commissioned Cadmus to perform the study through a Request for Proposals process. (Response to SC-1, Question No. 16).

Q. Please describe the Potential Study methodology.

A. Using inputs from the Companies, its own research, and other sources, Cadmus analyzed the technical, economic, and achievable potential for electric and natural gas efficiency in the Companies' service territories. The study examined existing and new construction for a range of building types, vintages, and end uses, for the residential and commercial sectors only. (Exhibit MEH-3, p. 1).

For the study, Cadmus developed a baseline energy consumption forecast that accounted for naturally-occurring efficiency and pending changes in codes and standards. (Exhibit MEH-3, pp. 13-14). For developing technical potential, Cadmus considered a range of "proven, commercially available technologies." (Exhibit MEH-3, p. 8). Economic potential, a subset of technical potential, was derived by screening each measure for cost-effectiveness using the TRC test. (Exhibit MEH-3, p. 20). Cadmus then derived the achievable potential estimate by modeling low, medium, and high achievable potential scenarios based on assumptions about measure adoption if the customer was provided an incentive equal to 0%, 50%, or 75% of its incremental cost *(i.e.*, the cost premium for the energy-efficient measure relative to a standard efficiency measure) to represent the portion of economic potential assumed to be reasonably achievable in the course of the planning horizon. An additional constraint on the achievable potential analysis was that no incentive could exceed $100 per kW-year, equivalent to the Companies' assumed avoided cost of capacity. (Exhibit MEH-3, pp. 42-43).

Significantly, Cadmus relied on inputs from the Companies for its analysis, including load forecasts, long-term avoided costs, system loss factors, and a discount rate. (Exhibit

MEH-3, p. 1). Cadmus noted that "[s]ince the Company had already vetted the [input] data, Cadmus did not validate them and used the data as provided." (*Id.*). Avoided costs included annual, time-differentiated avoided electricity and natural gas values. (Response to SC-1, Question No. 12). Avoided costs were used to screen each measure for cost-effectiveness using the TRC test. (Exhibit MEH-3, p. 20). The adequacy of the screening mechanism is discussed in Section 5 of this Testimony.

Q. Please describe the Potential Study conclusions.

A. Cadmus estimates technical potential for the residential and commercial sectors to be 26% and 17% of base sales, respectively. (*Id.* at p. 32). Economic potential is estimated to be 12% of base sales for the residential sector, and only 8% of base sales for the commercial sector. (*Id.*). As noted in the Potential Study, the estimate of total residential and commercial economic potential for the Companies' service territories as a percent of base sales, 10%, is lower than the range seen in other jurisdictions, 15% to 35%. (*Id*. at p. 4).

The Potential Study found that achievable potential results are even lower, at 7.1% of base sales for the residential sector and 4.7% for the commercial sector, under the high achievable potential scenario. (*Id.* at p. 5).

Natural gas achievable potential results are somewhat higher, at 9 and 8 percent of base sales for the residential and commercial sectors respectively. (Exhibit MEH-3, p. 6).

Given its relatively low estimates of achievable potential, the Cadmus study concludes that the achievable potential will be exhausted by 2020. (Exhibit MEH-3, p. 47).[21] The Study states:

> Compared to the estimated annual potential, the Company's targets are well above the 53,000 MWh estimated annual potential from the residential and commercial sectors. As illustrated in Figure 3, the results of this study indicate that the Company's planned acquisition rate of 200,000 MWh per year would deplete the medium-case achievable discretionary potential of 1,060,000 MWh in less than six years.

[21] In his direct testimony, Company witness Hornung stated that the Companies are on track to exhaust their achievable energy efficiency two years earlier, by 2018. (Testimony of Michael E. Hornung, p. 6, lines 17-19. The Companies explain the discrepancy between the Potential Study and Mr. Hornung's testimony by stating that the Potential Study did not incorporate 2013 actual program performance, which exceeded the targets. *See* Response to Sierra Club's Initial Request No. 11.

(Exhibit MEH-3, p. 7).

Q. Are there general considerations that might affect how the Commission should interpret the Companies' estimates of efficiency potential?

A. Yes. DSM potential studies are an important tool and can help the Companies expand their use of the efficiency resources. While helpful as a reference point in determining goals, potential studies, if not done correctly, can understate the actual efficiency potential over the long-term. Common mistakes made can include the following: when estimating technical potential, relying only upon proven technologies or outdated technologies; including few or no new efficiency technologies developed in the future; overestimating certain efficiency measure costs; assuming no energy savings synergies when multiple measures are installed; and having a limited scope with regard to sector, end-use, and technologies. Another potential issue is that, when estimating economic potential, studies may use conservative estimates of benefits, and assume little or no reduction in efficiency measure costs in the future. Finally, when estimating achievable potential, studies may assume limited funding levels and fail to account for evolving best practices in program designs that can help increase customer adoption of efficiency measures.[22]

A review of potential studies in the Northwest demonstrates the importance of viewing potential studies as a guide, not as a ceiling, on EE potential. The Pacific Northwest region has saved roughly 30,000 GWh since 1991, more than the energy efficiency potential estimates identified back in the region's 1991 study.[23] Despite achieving even more savings than were identified in 1991, the latest power plan in 2010 concluded that there is the potential for additional efficiency savings of roughly 38,000 GWh, raising This illustrates several important points about potential studies:

[22] *See* Energy Futures Group 2012, *Ten Pitfalls of Potential Studies*, prepared for the Regulatory Assistance Project, November 2012, available at http://www.raponline.org/document/download/id/6214.
[23] American Council for Energy Efficient Economy, "Beyond Supply Curves," Fred Gordon, Lakin Garth, Tom Eckman, and Charles Grist, 2008 ACEEE Summer Study on Energy Efficiency in Buildings, August 17, 2008. NWPCC. "Sixth Northwest Conservation and Electric Power Plan," February 2010, available at http://www.aceee.org/files/proceedings/2008/data/papers/8_419.pdf.

- Efficiency potential studies at any one point in time can understate the full potential available in the future.
- DSM planners should recognize the limitations of potential studies and not assume that their results represent a "ceiling," or a limit, to future energy efficiency savings.[24]
- It is very unlikely that a utility will ever "exhaust" its efficiency potential, as new technologies emerge, new opportunities are identified, and new program delivery practices are developed.

Thus, potential studies should be comprehensive and conducted according to industry best practice, and used in conjunction with other analyses to ensure that utilities are maximizing their use of cost-effective energy efficiency resources.

Q. Please describe how efficiency potential studies can be conducted to help provide a more comprehensive picture of the future efficiency potential.

A. Potential studies can minimize the tendency to underestimate the efficiency resource by employing more inclusive assumptions. Comprehensive potential studies include emerging technologies and assumptions of new technologies; energy savings synergies; a complete examination of all sectors, end-uses, and technologies; more comprehensive avoided cost estimates, declining costs over time; a variety of funding levels; and best practice measure adoption rates.

[24] Achievable potential is a subset of economic potential and further screens out measures that, for practical policy, infrastructure, funding, and consumer response limitations, cannot be delivered. As the "achievable amount" depends on a variety of factors, some studies have developed a variety of scenarios based on different assumptions on incentive levels, program budget, market interventions, and customer adoption rates. Such scenarios may include classifications such as "achievable low potential," "achievable program potential," "achievable high potential," and "maximum achievable potential." Because of the uncertainty in the assumptions, achievable potential should not be misconstrued as a ceiling on cost-effective savings opportunities.

Specific Concerns with the Company's EE Potential Study

Q. Please summarize your concerns with the EE Potential Study conducted by Cadmus.

A. I have several major concerns with the inputs, assumptions, and consequently the results of the Efficiency Potential Study performed by Cadmus. These concerns, which led to an understatement of potential savings, include the following:

- The scope should not have been limited to "commercially available technology" and "current market costs," neglecting savings achievable through use of new and emerging technologies that are likely to be cost effective within the next few years.
- Incentives should not have been limited to a maximum of 75% of incremental cost for developing achievable potential.
- The Potential Study should have included potential savings from the industrial sector.
- As discussed above, the cost effectiveness screens exclude several important benefits of DSM.

These shortcomings and omissions resulted in an achievable potential analysis that incorrectly deemed many measures to be not cost-ineffective, and as a result found low efficiency potential in the Companies' service territories.

Q. Turning to your first concern, what concerns do you have about the measures considered in the Cadmus Potential Study being limited to "commercially available technology" using "current market costs?"

A. According to page 8 of Exhibit MEH-3, Cadmus limited the scope of the energy efficient measures to "commercially available technology" using "current market costs." In other words, new and emerging efficiency measures and currently cost-ineffective measures were not included in the analysis. Emerging technologies can make a significant difference in the amount of future efficiency opportunities.

Experience shows that the costs of efficiency measures decline over time. Studies that assume little or no reduction in efficiency measure costs in the future tend to significantly underestimate cost-effective opportunities. The Companies acknowledge the role that

declines in technology costs could play in expanding efficiency opportunities in response to discovery:

> Based on the market Potential Study prepared by Cadmus, the Companies are on track to exhaust all of the estimated medium-case achievable discretionary electric energy efficiency potential prior to 2020. The study was prepared using existing technologies and costs. Declines in technology costs, the development of new technologies, or the increase in the Companies' avoided energy and demand costs could provide additional energy savings opportunities in the future.

(Response to SC-1, Question No. 29(b)(i), Case No. 2014-0002, attached as Exhibit TW-5).

Q. Can you provide an example of how the Potential Study results were affected by the "current market costs" assumption?

A. Yes. Cadmus finds that the change in the consumption baseline, largely due to the Energy Independence and Security Act (EISA) lighting standard, coupled with the current cost of LED bulbs, results in low achievable potential in high efficiency lighting. Cadmus assumed that CFLs offer no economic or technical potential over the study period and did not assess LEDs because of their cost. (Exhibit MEH-2, pp. 17-18). However, Cadmus notes that,

> LED costs have come down rapidly over the past few years. One product released recently sells for under $10; however, even at this price LEDs were not found to be cost-effective in the Company's Potential Study. As LED technology and lighting markets mature over the next few years, Cadmus anticipates energy-efficiency programs will change rapidly to capture the new savings stream available through LEDs.

(Exhibit MEH-2, p. 18).

Q. Do you agree with the Potential Study conclusions regarding the lack of potential for high efficiency lighting?

A. No. As I discussed previously, the cost effectiveness screening in the Potential Study was flawed. Moreover, the decision to use current market costs of efficiency measures does not allow for consideration of widely-anticipated LED cost reductions in the next few years. As seen in the previous quote from the study, Cadmus' review acknowledges and anticipates that LEDs will achieve declining costs. (Exhibit MEH-2, p. 18). For these reasons, I believe that Cadmus has overstated the impact of the EISA standards on the DSM potential associated with lighting measures.

Q. How would these assumptions likely affect the results of the Potential Study?

A. Excluding new and upcoming technologies from the analysis constrains the results of the study. Likewise, assuming that measure prices will remain at current levels means that measures that are borderline cost-effective today but are expected to be cost effective over the period of analysis would not be considered. The decision not to include new and upcoming technologies and to assume current market costs had significant impacts on the final proposed DSM/EE Plan. For example, the exclusion of LED bulbs from the Potential Study is clearly linked to the Companies' decision not to continue to offer the Residential High Efficiency Lighting program. In my opinion, including upcoming technologies and allowing for cost reductions over time in the Potential Study would have dramatically increased the technical, economic, and achievable potential for both electricity and gas beyond the conclusions of the Cadmus study.

Q. Turning to your second concern, please describe the Companies' methodology for developing achievable potential.

A. For the high achievable potential scenario, the study assumed that financial incentives would be limited to 75% of incremental cost of the efficiency measure. (Exhibit MEH-3, pp. 42-43). In my experience, financial incentives this high should be able to achieve higher acceptance rates than what was assumed for the high achievable potential scenario. I am aware of many states that have achieved higher levels of efficiency savings with financial incentives of 75% of the measure cost or less.

Q. Do you have other concerns about the methodology for developing achievable potential?

A. Yes. The analysis of achievable potential involved placing a cap on customer incentives, such that no incentives exceed $100 per kW-year. This amount reflects an assumption about the Companies' avoided cost of capacity. (Exhibit MEH-3, pp. 42-43). The reasoning for this constraint is that "it would be otherwise more economical to serve energy from supply-side resources." (Response to SC-1, Question No. 20).

Q. Do you agree that the avoided cost of capacity should by itself be a limit on achievable potential?

A. No. This is an overly simplistic way to compare the cost of an efficiency measure with the cost of supply-side resources. A proper comparison would include not only avoided

capacity costs, but also avoided energy costs, as well as environmental compliance costs, and participant NEBs (as discussed in detail above).

Q. Turning to your third concern, what are your concerns with the Potential Study not including potential savings from the industrial sector?

A. As I discuss in Section 7, above, the industrial sector comprises a significant portion of the Companies' sales, and in general industrial energy efficiency is highly cost effective. Based on the available evidence, I conclude that the failure of the Companies to even study the potential in their service territories is a serious omission, and that including the industrial sector in the Potential Study would have dramatically increased the technical, economic, and achievable electric and gas potential beyond the Cadmus Potential Study results.

Q. Turning to your fourth concern, please explain your concern regarding the important benefits of DSM that were excluded from the cost effectiveness screens.

A. As I discuss in Section 5 of this testimony, above, the cost effectiveness screens did not include avoided environmental compliance costs and participant non-energy benefits. Accounting for these benefits would increase the number of measures that were deemed cost-effective and as a result, the potential savings could be much larger.

Q. Please summarize your conclusions on the Potential Study.

A. The scope of the Potential Study was inappropriately limited by 1) consideration of only "commercially available technology" and "current market costs," 2) incentives capped at a maximum of 75% of incremental cost, 3) failure to include the industrial sector, and 4) cost-effectiveness screening that did not include widely-accepted benefits of DSM. For all of these reasons, the conclusion that potential will be tapped by 2020 (or 2018 per the Companies' calculation) is unfounded and erroneous.

Q. What do you recommend the Commission do regarding future potential studies?

A. I recommend that the Commission require that future studies from the Companies (i) include all sectors in the analysis of efficiency potential; (ii) consider new and upcoming technologies and future measure costs; (iii) include all of the substantial and widely-recognized benefits of DSM, including the cost of environmental compliance and non-energy benefits; (iv) and apply more reasonable approaches to estimate the achievable potential.

9. THE HISTORIC DSM PROGRAM REVIEW IS ALSO UNDULY LIMITED.

Q. Please describe the DSM program review methodology.

A. In conjunction with the study of energy efficiency potential, Cadmus completed a review of the Companies' existing programs and offered recommendations for modifications and terminations of specific programs. The Program Review included "a detailed consideration of the Company's existing programs, a gap analysis to identify any potential new program measures and delivery options resulting from the Potential Study, secondary research on a range of programmatic topics, and development of recommendations for each program moving forward." (Exhibit MEH-2, p. 1). Cadmus considered best industry practices for comparable programs in other jurisdictions. (See, e.g., Exhibit MEH-2, pp. 33-34).

Q. Please summarize your findings regarding the DSM Program Review.

A. My findings are as follows:

- The gap analysis considered only the Potential Study results and therefore, for the reasons stated in the previous section, was limited to only a portion of the sectors, measures, and opportunities that are actually cost effective and have achievable efficiency potential.
- The scope of the gap analysis should not have been limited to measures with an incremental cost of at least $30.
- Additional alternative program designs should have been considered.

Q. Turning to your first finding, please explain your concern that the Companies' gap analysis considered only the results of the Potential Study.

A. As discussed previously, the scope of the Potential Study was inappropriately limited by 1) cost-effectiveness screening that did not include widely-accepted benefits of DSM, 2) failure to include the industrial sector, 3) consideration of only "commercially available technology" and "current market costs," and 4) incentives capped at a maximum of 75% of incremental cost. These assumptions and inputs all have the effect of limiting the range of measures that should have been considered for the gap analysis.

Q. Turning to your second finding, please explain your concern about how the incremental cost was used in defining the scope of the gap analysis.

A. The Companies did not consider measures with incremental costs of less than $30 other than Residential Lighting, "due to issues the Cadmus Group presented regarding program delivery and transaction costs." (Response to SC-2, Question No. 22). According to the Cadmus Program Review,

> Due to program delivery and transaction costs associated with processing rebate applications and to the risk of incurring high levels of free ridership, measures with incremental costs lower than $30 were deemed inappropriate for downstream rebates.

(Exhibit MEH-2, p. 6, footnote 2).

This approach unduly screens out efficiency measures that may be cost-effective. Concerns about free ridership should not be used to blindly eliminate efficiency measures in this way, unless there is evidence as to the extent of the free ridership and other options for addressing it are not available. Further, transaction costs associated with rebate programs can be significantly reduced, or even eliminated, using alternative delivery mechanisms, as discussed in the next section.

Q. Turning to your third finding, please explain your conclusion that the DSM Program Review failed to consider other program delivery mechanisms for measures with low incremental costs.

A. Despite citing high costs associated with a rebate program model, the Review apparently only considered downstream mechanisms, that is, mechanisms that provide incentives directly to the end consumer, for these lower incremental cost efficiency measures. (Response to SC-2, Question No. 22). It appears that neither mid-stream incentive delivery mechanisms, (*i.e.*, entering agreements with retailers to reduce the cost of measures to be sold in the Companies' service territories), nor upstream mechanisms, (*i.e.*, providing incentives to manufacturers and distributors to reduce prices for measures targeted at specific markets), were considered for *any* program or measure, regardless of its incremental cost.

Q. Why should mid-stream and upstream delivery mechanisms be considered?

A. Mid-stream and upstream incentives may be suitable for measures with small incremental costs and small per unit incentives, such as LEDs, CFLs, specialty CFLs, and consumer

electronics. While evaluation is more challenging and free ridership may be higher with a mid-stream or upstream program design than with a down-stream one, utilities are successfully transforming markets by employing these approaches. Mid-stream and upstream incentive programs can be very successful, especially if program administrators collaborate to create a larger market.[25] The Companies should consider collaborating with other utilities in Kentucky and in the region to implement this kind of delivery mechanism.

10. CONCLUSIONS AND RECOMMENDATIONS.

Q. Please summarize the conclusions that you have made in your testimony above.

A. Based on my review of the Companies' filing and data responses, I reach the following conclusions:

- The Companies' existing DSM/EE programs are highly cost-effective, and provide significant benefits to customers. Overall, every dollar that the Companies spend on DSM/EE programs results in roughly three dollars in reduced electric system costs.

- The Companies significantly understate the benefits of energy efficiency by failing to include the avoided costs of complying with environmental regulations and program participant non-energy benefits in the cost-benefit analysis. Consequently, many of the Companies' findings and proposals in this docket are premised on understated benefits, and thus miss significant opportunities to reduce customer costs.

- The Companies have not provided sufficient justification for deciding not to seek to extend some of their DSM/EE programs after 2014. The programs that are set to expire have been highly cost-effective, could continue to be cost-effective, and could provide additional energy savings and other important benefits to customers.

- The Companies have not evaluated the opportunities available from industrial DSM/EE programs, despite an interest among their industrial customers for such

[25] *See, e.g.*, Dooley, Kopf, *et al*., "Plug Load Programs—Success, Attribution and Where We Go From Here." Available at http://www.aceee.org/files/proceedings/2012/data/papers/0193-000202.pdf.

programs, and are therefore missing opportunities to achieve a significant amount of cost-effective savings.

- The Energy Efficiency Potential study prepared for the Companies suffers from several significant limitations that result in underestimating the economic and achievable potential for efficiency savings.

- The Companies could further reduce costs by expanding their DSM/EE Plan to include additional program designs, to include larger program budgets, and to reach greater numbers of customers.

Q. Please summarize your recommendations.

A. The existing programs appear to be cost-effectively saving energy, but the Companies could achieve greater cost-effective savings if they addressed several deficiencies in their proposal and underlying analyses. Therefore, I recommend that the Commission conditionally approve the Companies' DSM/EE Plan. In particular, the Commission should approve the DSM/EE Plan, as long as the Companies commit to the following conditions:

- Continue to offer the Residential High Efficiency Lighting, Residential New Construction, HVAC Tune-Up and the Dealer Referral programs, which are set to expire this year.

- Expand the program budgets for the modified programs so that the modifications enhance the programs, rather than shift the focus from one customer sector/measure to another.

- Begin offering industrial customers energy efficiency services as soon as is practical during the 2015-2018 plan period. This could be accomplished fairly easily during this period by expanding the Commercial Conservation program to provide tailored services to industrial customers.

- Develop and implement more state-of-the art DSM/EE program delivery designs to improve the efficacy of the programs, e.g., by using upstream programs to reduce the cost of efficiency measures sold in retail stores without the need for rebates.

- Increase the budgets for several efficiency programs that serve key customer types. This should include the Residential Low Income Weatherization (WeCare), the Residential Conservation, and the Commercial Conservation programs.

For the purpose of future DSM/EE Plans, I recommend that the Commission require the Companies to improve their methodologies and assumptions regarding their DSM/EE cost-effectiveness and potential analyses. Specifically, the Companies should:

- Include the best available estimates of the costs of complying with current and future environmental regulations, including future state and federal regulations requiring reduced emissions of GHG, in their avoided cost estimates.
- Include the best available estimates of participant NEBs, in both the Participant and the TRC tests.
- Include a detailed description, analysis and proposal for Industrial DSM programs.
- Improve their DSM potential analysis by examining all customer sectors; considering new and developing technologies; including all of the benefits of DSM, and applying more reasonable approaches to estimate the achievable potential.

Q. Does this conclude your direct testimony?

A. Yes, it does.

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR REVIEW, MODIFICATION, AND CONTINUATION OF EXISTING, AND ADDITION OF NEW, DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAMS	)	**CASE NO. 2014-00003**

VERIFICATION

COMMONWEALTH OF MASSACHUSETTS)
)
COUNTY OF MIDDLESEX)

I, Tim Woolf, being duly sworn, state and affirm the following: the foregoing prepared Direct Testimony constitutes my direct testimony in the above-captioned proceeding; I would give the answers set forth therein if asked the questions propounded therein; and the answers contained therein are true and correct to the best of my information, knowledge and belief.

Tim Woolf

SUBSCRIBED AND SWORN to before me this 11 day of April 2014.

JANICE CONYERS
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

Notary Public

My Commission Expires:

7.27.2018