BEFORE THE
ARKANSAS PUBLIC SERVICE COMMISSION

IN THE MATTER OF THE CONTINUATION,	)	
EXPANSION, AND ENHANCEMENT OF	)	**DOCKET NO. 13-002-U**
PUBLIC UTILITY ENERGY EFFICIENCY	)	
PROGRAMS IN ARKANSAS	)	

COMMENTS OF ARKANSAS ADVANCED ENERGY ASSOCIATION

Introduction

The Arkansas Advanced Energy Association (AAEA) represents a blend of manufacturers, energy providers, entrepreneurs, small business owners, educators, researchers, consultants, and public officials whose common interest and expertise focuses on advanced energy and economic development in Arkansas. In 2012, the AAEA released a study that showed the state is home to over 90 advanced energy companies across 22 advanced energy industry segments that collectively employ 11,337 Arkansans. The largest number of jobs, nearly 2500, is found in heating, ventilation, and air-conditioning and building controls. The next largest number of jobs, nearly 2100, is found in energy-saving consumer products. It is on behalf of these companies and their employees that AAEA submits the following comments.

Parties Working Collaboratively – Lessons Learned

AAEA is supportive of the current Parties Working Collaboratively (PWC) process for defining and addressing energy efficiency related issues. We appreciate the time, effort, and skill that Matt Klucher, Fran Hickman, and Katherine Johnson have given the PWC and their efforts to find common ground with as many of the parties as is possible. Should the Arkansas Public Service Commission (APSC) continue the present PWC process, it is AAEA's desire that the general staff's facilitation of the PWC does not compromise its independence as an impartial arbitrator. AAEA believes that the PSC staff must be on guard to maintain objectivity and thus able to make independent recommendations to the Commission. AAEA also does not believe it is necessary to achieve full consensus by all parties on all issues. Instead, AAEA believes it is very important for the APSC to know party positions and the reasons why parties consent or object to particular issues and to take those differences and shape public energy policies.

A primary tenet of AAEA and its educational affiliate, the Arkansas Advanced Energy Foundation (AAEF), is to identify and recruit Arkansas-based talent to assist with technical and legal expertise. AAEA and AAEF have partnered with the Applied Sustainability Center to present legislative energy workshops and economists at HISTECON Associates, Inc. and the University of Arkansas at Little Rock (UALR) to assist with energy policy analyses. It behooves the state for it to develop and to utilize its home grown talent, thus retaining both wealth and a skilled workforce.

With that said, AAEA is in agreement with the five policies addressed by the PWC: timing change, single docket, incentives, avoided costs, and non-energy benefits (NEBs). AAEA with funding support from AAEF, however, does have specific research and comments concerning avoided costs and non-energy benefits that it requests the APSC to consider and to authorize the PWC to address at the next meetings of the collaborative. AAEA further encourages the APSC and the PWC to invite the foundation's researchers to elaborate on the information presented below. The research was conducted on behalf of AAEF by HISTECON Associates, Inc. and the Institute for Economic Advancement at UALR and consists of four parts, as follows:

1. **Analysis of the direct and indirect emissions from use of CT technology as a peaker unit;**
2. **Review of the issues regarding avoided costs (Av.C) in EE programs, including the addition of CO_2 costs in those calculations;**
3. **Analysis of the recent actions of key states in formulating EE programs that include Av.C and GHG emissions; and**

4. **Proposal for utilizing an Arkansas-based economic model for cost estimates of many NEBs.**

I. Summary of Findings from Natural Gas Fueled Generating Plants

Dr. Gregory Hamilton
IEA-UALR May 2013

Introduction

Following its earlier study that compared the emissions life-cycle of various electricity-generating plants,[1] the AAEA requested a comparison of combustion turbine plants with a standard natural-gas power plant. The PWC has noted that "market prices for capacity and energy may include implicit estimates for carbon prices." The present analysis emphasizes that any carbon-price estimates should be applied to both direct and indirect emissions for a complete accounting of the impact on the environment (e.g., property damage and health impacts as noted in the PWC statement).

This report summarizes the differential life-cycle impacts associated with natural gas (NG) fueled generating plants. The types of generating plants analyzed are a conventional natural gas combined cycle (NGCC) plant, a conventional combustion turbine (CCT) plant, and an advanced combustion turbine (ACT) plant. The life-cycle analysis focused on estimating the two types of emissions.

The direct emissions are the level of emissions associated with a generating plant's NG consumption. The second types of emissions analyzed are the indirect emissions. These emissions are due to differences in the economy's emission level across all industries. These differences are the result of the differential impacts on the economy's commodity and resource

[1] HISTECON Associates, Inc. *Utility Avoided Costs in Arkansas: Present and Future Implications For Developing Renewable Energy*, Arkansas Advanced Energy Association, May 2012.

mix that are a consequence of each generating plant's impact upon the economy. Different types of generating plants and different levels and fuel usage by a plant will impact an economy differently, and these differentials result in different levels of emissions in the economy's industries. Taken together, these emissions are the indirect emissions of a generating plant.

The analysis was divided into three areas. In the first area the generating plants were specified. Their capital costs were estimated and the annual consumption of NG was estimated to produce an electrical load equal to 85 percent of the normal capacity of the generating plant. Knowing the annual consumption of NG allowed the direct emissions associated with the electric power generation to be estimated.

In the second phase of the life cycle, the estimates of the annual fuel costs, revenues earned from the generation of power, and construction costs were input into an Arkansas Economic Model (IEA- UALR's REMI's 70-Sector Model of Arkansas) over a 35-year period (2015-2050). The Arkansas Economic Model is a dynamic model of Arkansas's economy that incorporates a utility industrial sector (electrical power generation). This sector was modified to account for the different resource mix associated with a NG-fueled generating plant. Differences between the generating plants in terms of revenues, natural gas consumption, and construction costs have differential impacts on the economy over the life cycle of the generating plant. The differential economic impacts result in differences in the amounts of emissions over the life cycle of the generating plants. These are the indirect emissions that are estimated in the third phase of the life-cycle analysis.

The economy's output mix differs over the 35-year life cycle of a generating plant due to differences in the fuel use, resource mix, and revenue earned from generation. Data that related the output mix to its emissions mix were derived from Economic Input-Output Life Cycle

Assessment Model (EIO-LCA Model) developed by Carnegie Mellon University. Using this data it was possible to construct a matrix of technical coefficients that related units of output by industry to units of emissions by type of pollutant. Thus, it was possible to convert industry output levels to emissions levels. The industry output estimates from the Arkansas Economic Model derived from the simulations were converted into indirect emission estimates for the economy using these technical coefficients. Combining the estimates of the direct and indirect emissions for each type of generating plant over the 35-year period yielded a life-cycle estimate of emissions. As shown in Table 1, currently the combination results are only available for CO_2 emissions because EIO-LCA does not contain factors for other pollutants.

Generating Plants Specification

A specification for each generating plant is based on EIA's generic utility-scale generating plants (Updated Capital Cost Estimates for Electricity Generation Plants, U.S. Energy Information Administration, Office of Energy Analysis, U.S. Department of Energy, and November 2010). Those specifications included the normal capacity, the heat rate (BTU/kWh), the overnight capital cost ($/kWh), the fixed and variable operating costs, and environmental characteristics as related to emissions of CO_2, SO_2, and NO_x (LBS/MMBTU).

The steps followed in the specification phase were:

1. <u>Calculation of the mWh per year by each generating plant</u>. A load factor of 85 percent was assumed over the life cycle to estimate the load (Normal capacity (kWh)* 85 percent = Load (kWh)). There are 8,760 hours in a year so that kWh per year were estimated by multiplying the plant's kWh load by hours per year (kWh)* (hours per year). This was then converted into mWh per year by dividing by 1,000.

2. <u>Calculation of consumption of MCF of NG per year</u>. To compute the NG consumption that is necessary to produce the mWh per year, the heat rate of the power plant (BTU/ kWh) and the heat content of the fuel (BTU/Unit of Fuel) were combined. By dividing the heat rate of the power plant by the heat content of the NG ((BTU/ kWh)/ (BTU/CF)), yields the CF per kWh (CF/kWh) or the number CF of

NG necessary to produce a kWh. Multiplying number of CF per kWh by the number of kWh gives an estimate of the number of CF of NG necessary to produce the required kWh per year. Dividing by 1,000 converts CF per year into MCF per year.

3. Revenues, Fuel Cost and Capital Costs are computed using prices that were quoted by Energy Information Administration for Arkansas in 2010 ($4.48 CF and NG, 0.0728 cents/ kWh). EIA's overnight capital cost per kWh adjusted for Arkansas was used to estimate the costs of construction the normal capacity generating plants. These costs per kWh were multiplied by the normal capacity kWh. The construction period was assumed to be three years.

4. Direct Emission estimates were based on the number of CF of NG consumed per year in the process of generating power. EIA's conversion formulas were used to convert CF of NG into pounds of emissions as follows:

    a. CF = .120159 LBS of CO_2
    b. CF= .0001027 LBS of SO_2
    c. CF = .000003081 LBS of NO_x.

Arkansas Economic Model (AEM)

The estimated revenues from the generation of power, the fuel costs, and estimated construction costs were inputted into the model for the 35-year life cycle. In the simulations, the model treated these changes as demand changes and computed the economic impacts of these changes on inter-industry purchases, incomes, prices, amenities, and population over the 35-year period. The simulation findings were compared to the baseline forecast of the model to derive the impact of the construction and operation of a power generating plant. The model provided estimates of the change in output by industries that matched the industries in the EIO-LCA Model.

Economic Input-Output Life Cycle Assessment Model

The technical coefficients derived from the EIO-LCA Model converted industry output per million dollars into emissions per metric ton. It was possible using these coefficients to convert AEM's output estimates from the second phase into emission for all the industries impacted by the generating plant operations over its 35-year life cycle. These emissions are the indirect emissions over the life cycle of the plant. The indirect estimates of emissions were then added to the direct emissions to derive the total life-cycle emissions.

Emission Comparisons across the Power Generating Plants

To facilitate comparison of the life-cycle emissions of the power generating plants, the life-cycle emissions were expressed as emissions per kWh. CO_2 was the only type of emission comparable for both direct and indirect emissions. The accompanying Table 2 shows the results of the three simulations and conversions.

Table 1. Taxonomy of Major Pollutants and Measurable Costs Using REMI and EIO-LCA Models

		Types of Major Pollutant Costs							
Energy	Technology	Direct CO_2	Indirect CO_2	Direct SO_2	Indirect SO_2	Direct NO_x	Indirect NO_x	Direct Hg	Indirect Hg
Coal	IGCC/CCs	Yes	Yes	Yes	No	Yes	No	No	No
Coal	Advanced Pulverized	Yes	Yes	Yes	No	Yes	No	No	No
NG	Conventional NGCC	Yes	Yes	Yes	No	Yes	No	No	No
Wood	25 Biomass CC Plants	Yes	Yes	Yes	No	Yes	No	No	No
Com.Turbine	Natural gas fired	Yes	Yes	Yes	No	Yes	No	No	No
Wind	25 Biomass CC Plants	Yes	Yes	Yes	No	Yes	No	No	No

Table 2. Emissions Results for Three Natural Gas Energy Technologies

Total Emissions/kWh Over Life Cycle	Conventional Combustion Turbine	Advanced Combustion Turbine	Conventional Natural Gas Combined Cycle
CO_2 Life Cycle (MT)	14,986,080	87,406,235	215,594,196
kWh /YR	632,910,000	1,563,660,000	4,020,840,000
kWh /Life Cycle	22,151,850,000	54,728,100,000	140,729,400,000
CO2/ kWh Life Cycle (MTCO2/ kWh)	0.000676516	0.0015971	0.001531977
CO2/ kWh Life Cycle (LBSCO2/ kWh)	1.491041134	3.520007873	3.376477179

Power Plant	CCT	ACT	CNGCC
Direct Emission (lb per YR)			
CO2	803,447,600	1,783,745,145	3,316,589,874
SO2	687	1,524.57	2,834.69
NOX	20,601	45,737.06	85,040.77
35 year life cycle			
Direct Emission (lb per Life Cycle)			
CO2	28,120,665,983	62,431,080,075	116,080,645,590
SO2	24,035	53,360	99,214
NOX	721,043	1,600,797	2,976,427
Direct Emission (MT 35-yr. Life Cycle)			
CO2	12,758,922.86	28,326,261.38	52,668,169.51
SO2	10.91	24.21	45.02
NOX	327.15	726.31	1,350.47
Indirect Emission (MT per Life Cycle)			
CO2	2,227,157	59,079,974	162,926,026
Grand Total (MT per Life Cycle)			
CO2	14,986,080	87,406,235	215,594,196

II. Mandating a Common Value for Avoided Costs in EE Programs

(HISTECON Associates, Inc.)

Building on the earlier National Action Plan, the Plan's authors proposed a vision for national energy use by 2025. Among other features, the vision called for increased EE and reduced energy production that would create benefits such as:

- More than $100 billion in lower energy bills in 2025 than would otherwise occur.
- Annual energy savings exceeding 900 billion kWh.
- Reductions in greenhouse gas emissions on the order of 500 million metric tons of CO_2 annually.[2]

In order to achieve these benefits, the plan relied heavily on the ability of individual states to develop aggressive EE programs. Critical to meeting these goals are the establishment of reliable avoided cost (Av.C) metrics and the inclusion of a cost for GHGs like CO_2. The report demonstrates how 14 state utility commissions were already attempting to deal with these requirements in 2008. Since then, all states have focused on possible federal mandates regarding GHG emissions for old and new power plants, including a proposed EPA limit of 1,000 pounds of CO2 per mWh produced at new generating plants.[3] (Section 3 focuses on several states that have developed workable procedures within their EE programs.)

However, it appears that many other states are not rigorously following these critical elements in their EE programs: "Many states are applying methodologies and assumptions that

[2] *National Action Plan for Energy Efficiency: Vision for 2025*, U.S. Department of Energy and Environmental Protection Agency, November 2008.

[3] "Obama looks at tweaks in greenhouse-gas rules," *Washington Post*, Mar. 17, 2013.

do not capture the full value of efficiency resources, leading to under-investment in this low-cost resource, and thus higher costs to utility customers and society.[4]

This failure to follow "best practices" in the EE field leads to an undervaluation of conservation measures and implicitly to a cost to utility customers.

> Energy efficiency programs result in several types of avoided costs, and each of them should be included in the screening analysis and calculated correctly. First and foremost, avoided energy and capacity costs should be based on long-term forecasts that properly capture the energy and capacity impacts of energy efficiency resources, account for the structure of the market in which the relevant utility operates, and capture differences between peak and off-peak periods.[5]

One of the principal losses for society in general is the lack of accounting for environmental damages, especially GHG emissions. EE programs have an important role to play here through the mechanism of utility Av.C. "Energy efficiency is by far the lowest-cost and most plentiful option for meeting (GHG) initiatives. In order to meet climate change regulations at the lowest cost, the full avoided cost of complying with current and future GHG initiatives should be accounted for in screening energy efficiency programs."[6]

Many states have already assigned a schedule of annual values for utilities to use in the practical application of Av.C in EE and renewable-energy programs. For example, an ICF report indicates that annual Av.C for both energy and capacity were assigned for the six New England states from 2005 through 2030 on a levelized basis. The 2012 figure was about $0.05 per kWh

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

[5] *Ibid.*
[6] *Ibid.*

and rose to $0.065 by 2030. Capacity costs were about $76 per kW-yr. in 2012 and rose to about $78 by 2030.[7]

Xcel Energy has indicated that it considers carbon reduction as one of the three primary rationales for supporting DSM and EE programs, along with lowering energy costs and capacity costs.[8]

On a national basis, the Department of Energy has prepared a series of "reference cases" that include the projected costs of GHG for future energy production. Emissions projections for CO_2, SO_2, and NO_x from EIA for the period to 2025 and 2040 contain a host of assumptions about fuel costs, technology change, and long-term trends in electricity demand. However, the current reference cases for these projections use CO_2 fees of $10, $15, and $25 per metric ton to generate the projected impact of these carbon costs on future emission levels.[9]

The California PUC has mandated a statewide cost of CO_2 for utilities to use in their Av.C process. That cost is reflected in an $8 per ton adder (2005 dollars) with an annual increase set at five percent per year.[10] The Av.C figures use a seasonal adjustment for the energy loss factors during the year. Each of the state's utilities calculates their losses according to six periods: Summer Peak, Summer Shoulder, Summer Off-Peak, Winter Peak, Winter Shoulder, and Winter Off-Peak.[11]

---

[7] ICF Consulting, *Avoided Costs of Energy in New England Due to Energy Efficiency Programs*, Q-LF-015, Exhibit HD-02, Oct.3, 2005.

[8] Deb Sundin, "Energy Efficiency Programs: What Works? What Doesn't?" Xcel Energy, DSM and Renewable Strategy and Planning (presentation), June 23, 2010.

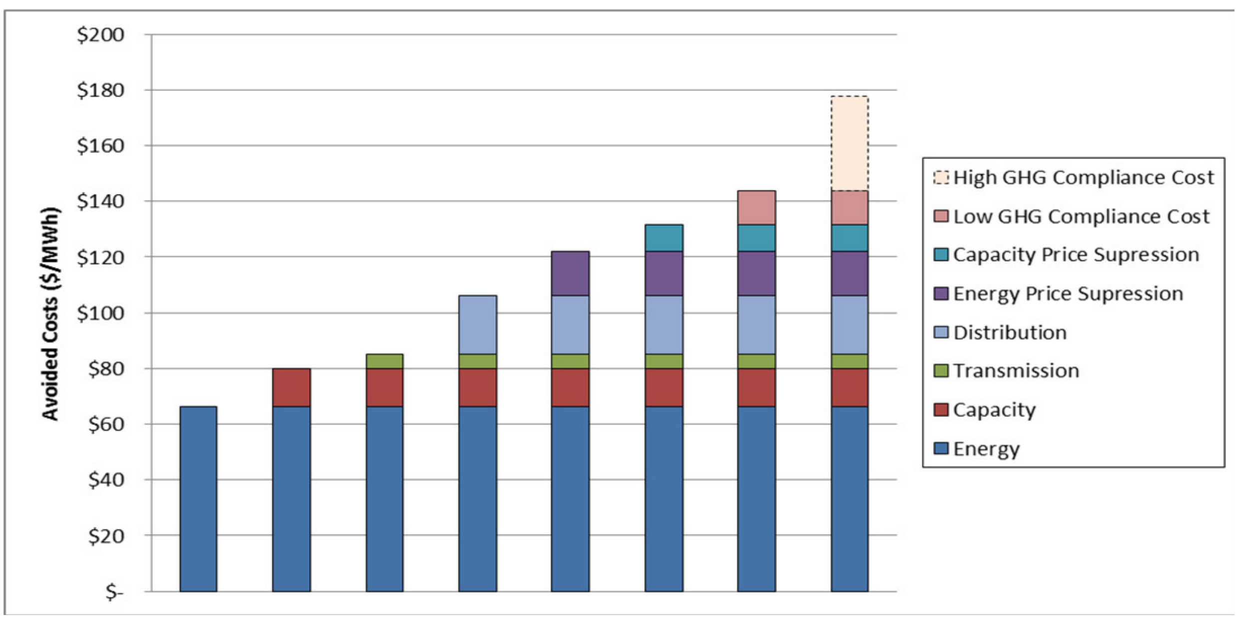
[9] U.S. Energy Information Administration, Office of Integrated and International Energy Analysis, *Annual Energy Outlook 2013 with Projections to 2040*, U.S. Department of Energy, Washington, April 2013; available on-line at: www.eia.gov/forecasts/aeo.

[10] California Public Utilities Commission. (2005, April 7). *Interim Opinion On E3 Avoided Cost Methodology*. Rulemaking 04-04-025 (Filed April 22, 2004). Available on-line at: http://www.ethree.com/CPUC/45195.pdf.

[11] Energy and Environmental Economics, Inc., *Energy Efficiency Avoided Costs 2011 Update*, December 2011.

What is striking about a recent comparison of the various components of one state's Av.C composition is that GHG costs could comprise a sizeable part of the total figure. Normally, the combination of four technology-related costs – energy, capacity, transmission, and distribution – is the primary Av.C. In the Massachusetts example in Fig. 1, these account for $0.06 to $0.10 per kWh. However, potential compliance costs from future GHG regulations could add between $0.01 and $0.03 to the total figure, depending on the level of restrictions on CO_2 and other emissions. The next section looks at several states that have included GHG costs in their EE planning.

Figure 1. Example of Avoided Costs Including GHG Costs, by Component



Synapse Energy Economics, *Best Practices in Energy Efficiency Program Screening*, National Home Performance Council, July 2012.

III. Lessons Learned from EE Programs in Key States

According to a recent survey, 20 states have active EE programs (see DSRE map). Arkansas has specific EE targets that are noted by DoE as "resource goals." Various utility commissions and regulators have grown their respective REPs and IRPs by either including EE or they have encouraged the growth of EE as a distinct yet not entirely separate objective. Primarily, the goals of both of these objectives are to reduce the general level of energy consumption via fossil fuels, the amount of pollutants, and other negative externalities.

Table 3 comprises and compares some important components of some key states' undertakings. The first five columns are partial reproductions of an earlier table from the NAPEE. California, Vermont, and Connecticut have had long-established and aggressive policies while other states have shown interest but lacked comprehensive standards. The information below details parts of what are capacious EE programs and their standards for the illustrative states in Table 3. The table also shares some details on the NEBs that have been determined by other states from their EE programs. A discussion of NEBs follows this section on specific state EE programs of interest.

California

It is generally accepted that California is a frontrunner for renewable energy and EE in the United States. CPUC states that, "due to the state's efficiency programs, per capita energy use has remained flat, while the rest of the US has increased by about 33 percent."[12] The last column in Table 3 displays data on California's energy efficiency program years 2010-2012. (There is neither representational bias for California or other states' policies intended nor a desire

[12] California Public Utility Commission, May 13, 2013; available on-line at http://www.cpuc.ca.gov/PUC /energy/Energy+Efficiency/.

for strict adherence to their guidelines, but the data are a source of substantive information and comparison.)

Though the avoided costs for energy and peak demand are not in dollars per kWh, the avoided energy recorded, as of December 2012, is 10,406 GWs saved since July of 2010. For peak demand, the IOUs have avoided 1,889 mW of capacity development. The CPUC has *a Standard Practices Manual* developed in 2001 that provides the framework for measuring cost effectiveness. Alongside this manual is the Energy and Environmental Economics (E3) standard model for calculating avoided costs that were referenced above.[13]

In 2011, E3 updated their model to include the environmental impact of CO_2. It should be noted that it includes an adder of $30 per short ton of CO_2. E3's middle forecast explicitly includes this vital component. Of course, the United States has not developed a national CO_2 market as of yet. Nevertheless, E3 estimates that in 2014 the annual average avoided cost for energy will be $50.00 per mWh, or $0.05 per kWh.

Texas

Texas Public Utility Commission Rule 25.181 establishes the procedures for meeting the mandates legislated in 1999. As with any effective program, a constant vigilance is needed to ensure that the most up-to-date and representative policies are enacted. As of January 1, 2013 the PUC's latest rule changes the efficacy metric from a percentage of load growth to a percentage of peak demand. Many analysts have begun focusing upon savings found from peak demand, either in summer or winter. While the rule establishes numerous procedures required of native utilities, the most vital for our purpose is the accounting of avoided energy and capacity costs.

[13] Energy and Environmental Economics, *Energy efficiency avoided costs 2011 update*, 2011; available on-line at http://www.cpuc.ca.gov/NR/rdonlyres/18579E92-07BD-4F24-A9B4-04975E0E98F5/0/E3 AvoidedCostBackground.pdf.

Rule-bound avoided energy costs are $0.064 per kWh for all electric utilities through program year 2012. As for the program year beginning in 2013, commission staff shall calculate the avoided energy cost in the subsequent manner:

> (A) Commission staff shall post a notice of a revised avoided cost of energy by November 15 of each year on the commission's website, on a webpage designated for this purpose, effective for the next program year…. By November 1 of each year, ERCOT shall calculate the avoided cost of energy… by determining the load-weighted average of the competitive load zone settlement point prices for the peak periods covering the two previous winter and summer peaks.
>
> (B) A utility in an area in which customer choice is not offered may petition the commission for authorization to use an avoided cost of energy other than that otherwise determined according to this paragraph. The avoided cost of energy may be based on peak period energy prices in an energy market operated by a regional transmission organization if the utility participates in that market and the prices are reported publicly. If the utility does not participate in such a market, the avoided cost of energy may be based on the expected heat rate of the gas-turbine generating technology specified in this subsection, multiplied by a publicly reported cost of natural gas.

The avoided capacity cost is $80/kW-year through program year 2012 and is up for a similar revision beginning in program year 2013. It references the use of both of the CT technologies used in these comments – conventional and advanced – for its cost comparisons.

> (A) By November 15 of each year, commission staff shall post a notice of a revised avoided cost of capacity on the commission's website, on a webpage designated for this purpose, effective for the next program year….
>
> (i) Staff shall calculate the avoided cost of capacity from the base overnight cost using the lower of a new conventional combustion turbine or a new advanced combustion turbine, as reported by the United States Department of Energy's Energy Information Administration's (EIA) Cost and Performance Characteristics of New Central Station Electricity Generating Technologies associated with EIA's Annual Energy Outlook….
>
> (ii) If the EIA base overnight cost of a new conventional or an advanced combustion turbine, whichever is lower, is less than $700 per kW, the avoided cost of capacity shall be $80 per kW. If the base overnight cost of a new conventional or advanced combustion turbine, whichever is lower, is at or between $700 and $1,000 per kW, the avoided cost of capacity shall be $100 per kW. If the base overnight cost of a new conventional or advanced combustion turbine, whichever is lower, is greater than $1,000 per kW, the avoided cost of capacity shall be $120 per kW.

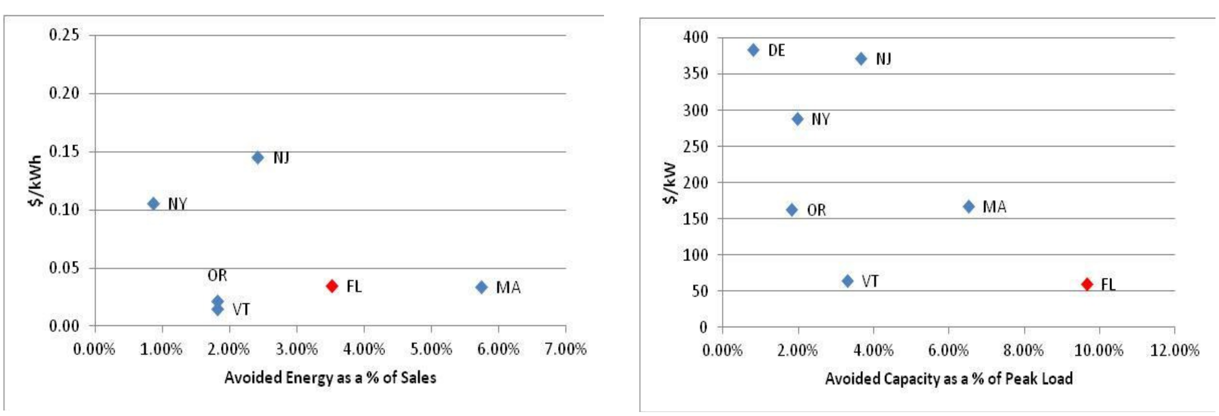
Florida

The Florida Energy Efficiency and Conservation Act (FEECA) requires that the Florida PSC institute policies and mandates to garnish energy efficiency, conservation, and demand-side management via the use of participating utility programs. A draft RPS proposal indicated that Florida's IOUs reported more than $250 million in conservation-related expenditures in 2007 (Docket No. 080503-EI, Date: December 31, 2008).

More recently, a comprehensive report by the University of Florida's Program for Resource Efficient Communities (Evaluation of FEECA) and the National Regulatory Research Institute found that FEECA avoided approximately 3.5 percent of their kWh sales (avoided energy) from the period 2001-2010 at a cost of approximately $0.035 per kWh. Additionally, peak demand was reduced by ten percent at a cost of $61 per kW (avoided capacity of peak load) during this period.

The following Figure 2 is from the FEECA report. Panel (a) is a comparison of avoided energy as a percentage of sales for six states with the dollar amount per kWh. Panel (b) is a comparison of seven states' avoided capacity as a percentage of peak load with the dollar amount per kW. The two charts indicate that Florida has achieved percentage reductions, in both energy and capacity, that are quite high relative to other states. The dollar amounts representative of these reductions are not, by far, the highest; however, the EE programs do reduce needed energy and capacity substantially.

Figure 2. Energy and Capacity Avoided Costs for Florida and Comparison States, 2001-2010



(a) (b)

Michigan

Michigan Act 295 – "the Clean, Renewable, and Efficient Energy Act" – mandates that electricity providers diversify their supply portfolios to include 15 percent of renewable energy generation and steadfastly increases the use of energy-efficiency programs or energy optimization (EO). The MPSC is required to furnish certain legislative committees an annual report regarding the impacts the EO programs have upon the state. For 2011, based on data calculations from the EPA for emissions estimates and the economic data from approximately 90 percent of the energy producers in Michigan, EO programs have avoided 1.1 billion, 6.5 million, and 3 million tons of CO_2, SO_2, and NO_x, respectively. Of course, the reduction in CO_2 emissions is greater than that witnessed in other states because Michigan has historically relied upon coal-fired energy generation.

In addition, Optimal Economics and Angelou Economics (OE) prepared an impact analysis for the MPSC in 2011 highlighting a twenty-year economic analysis. Using a base year of 2010 (the year after the program started and the year with utility's actual economic outlays) they estimate that 1,547 job-years[14] were created and that the gross state product increased by $119 million. Figure 3, presented to the requisite legislative committees in March 2013, indicates that for all prior years electricity providers have achieved or surpassed the level of reduced electricity generation required under Act 295. The figure and its general conclusions emphasize that with the appropriate guidelines and regulatory policies EE end-goal achievements are possible.

[14] As the authors state, "a job-year is the equivalent of one full time job for one year." The authors posit that using a job year is a metric where by the output is consistent with the net effects of economic outcomes. For instance, three jobs gained and one lost during a year is equal to a net positive effect of two. Hence, in this case, the job-years will indicate two.

Figure 3. Electricity Demand Reductions Achieved by Michigan EE Programs

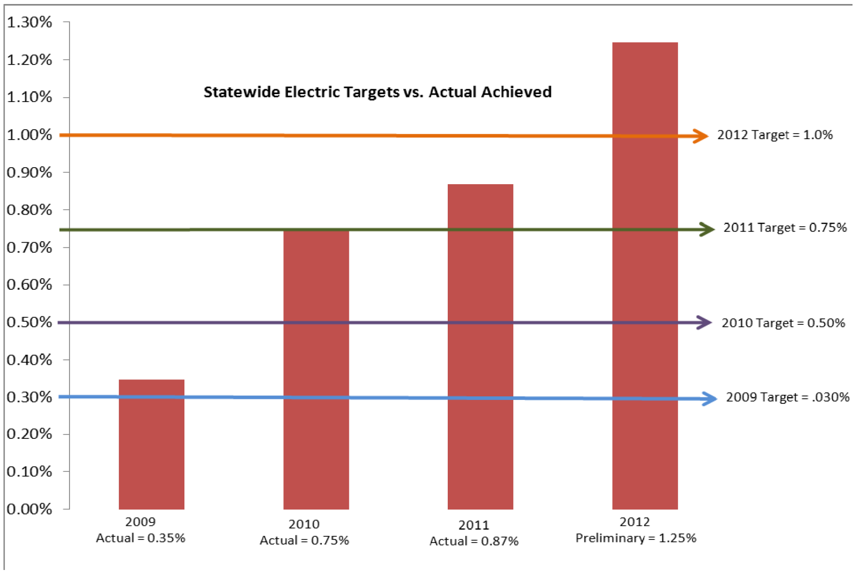


Table 3. Comparison of Selected State Energy-Efficiency Program Data

	SMUD (CA)[a]	CT[a]	MA[a]	VT[a]	CA[a]	MI	FL	TX
Period	2004	2005	2002	2004	2004	2011	2001-2010	2012
Avoided Emissions[b]	NO_x: 18	CO2: 198,586 SO_2: 123 NO_x: 334	CO_2: 161,205 SO_2: 395 NO_x: 135	Unspecified pollutants: 460,000 over lifetime	NR	CO_2: 1.1B SO_2: 6.5M NO_x: 3M		
Avoided Costs (2005$)								
Energy ($/kWh)		20.33	0.07	0.07	0.06		0.035[g]	0.055[f]
Capacity ($/kWh)			6.64	3.62			61[cg]	69.3[cf]
On-Peak ($/kWh)	0.08		0.08					
Off-Peak ($/kWh)	0.06		0.06					
Goals							Annual Energy DSM Goals 2010-2019 7,425 GWH	
Non-Energy Benefits	NR	Lifetime savings of $550M on bills	$21M bill reduction; 2,090 new jobs created	37,200 CCF of water	NR	2010: 1,547 job-years created; $119M increase in GSP[e]	Saved $250M in expenditures in 2007[d]	

Table Notes

[a]Reproduced From NAPEE 2006, Table 6-3.

[b]tons/yr for 1 program year.

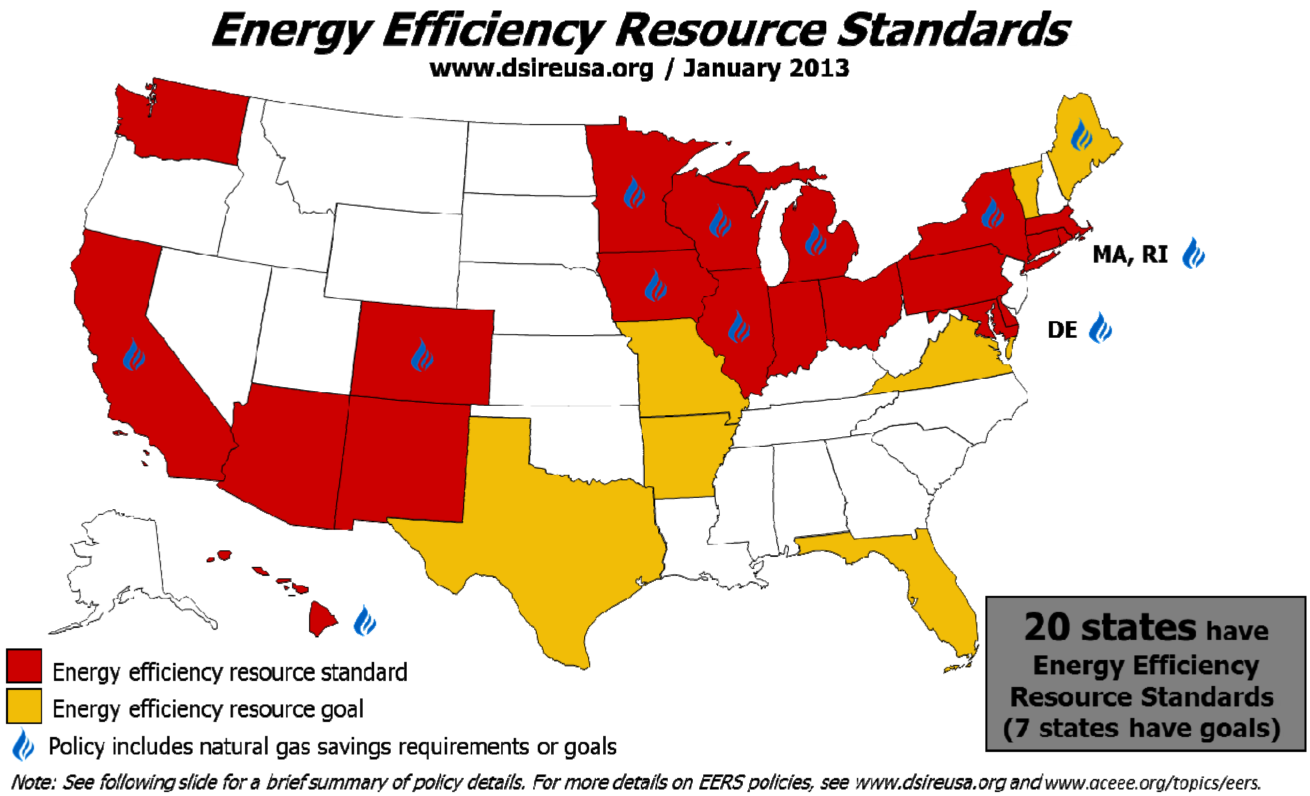
[c]Capacity is denoted in $/kW-year.

[d]Includes NEBs and other impacts.

[e]Report for the MPSC, "Economic Impacts of PA 295 Energy Optimization Investments in Michigan," Optimal Energy Inc. and Angelou Economics, 2011.

[f] Calculated using the GDP implicit price deflator value 115.387 for 2012. Base year is 2005.

[g] These are average figures for the period 2001-2010.


Energy Efficiency Resource Standards
www.dsireusa.org / January 2013
MA, RI
DE
20 states have Energy Efficiency Resource Standards (7 states have goals)
Energy efficiency resource standard
Energy efficiency resource goal
Policy includes natural gas savings requirements or goals
Note: See following slide for a brief summary of policy details. For more details on EERS policies, see www.dsireusa.org and www.aceee.org/topics/eers.

IV. Estimating the Non-Energy Benefits from Energy Efficiency Programs

In addition to the estimates of direct and indirect emissions that the REMI and EIO-LCA models generate, the approach can also be used to estimate some of the other impacts that are commonly known as "non-energy benefits" or NEBs. Just as the reduction in pollutants such as CO_2 can provide a beneficial reduction in the environmental costs of pollution, the same reduction can produce NEBs (also known as Other Program Impacts [OPIs]) in the areas of customer health, safety, comfort, and even economic development. Other potential factors might entail reduced costs for bill collection and service shut-offs, improvements in societal safety and health, and increased property values.[15]

> OPIs are often not accounted for in a comprehensive manner and are frequently ignored altogether. A recent survey found that most states use the TRC test as the primary test for screening energy efficiency programs; however, only 12 states quantify participant OPIs, and not all OPIs are accounted for among those 12 states. As a result, many states are applying the TRC test in a way that is skewed and understates the true value of energy efficiency. **This may be the most significant problem with energy efficiency program screening methods in the US today**.[16] (emphasis added)

A number of regional and national studies are available that have attempted to place numerical values on many NEBs.[17] Most observers have concluded that certain categories are more easily estimated, such as lower bills for consumers from EE, but that others may be more

[15]Synapse Energy Economics, *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for 'Other Program Impacts' and Environmental Compliance Costs*, Regulatory Assistance Project and the Vermont Housing Conservation Board, November 2012. See also *National Action Plan for Energy Efficiency*, U.S. Department of Energy and Environmental Protection Agency, July 2006.

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

[17]For a good discussion of these issues regarding NEBs, see Skumatz Economic Research Associates, *Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low Income Program Analyses in California*, Sempra Utilities, May 2010. See also Synapse Energy Economics, *Energy Efficiency Cost-Effectiveness Screening*, 2012.

difficult or nearly impossible to estimate reliably, such as increased comfort in the home. However, the REMI model contains a variety of state-level multipliers that can be used to determine changes in the economy that result from the changes in the choice of energy technologies that are used to supply customer demand for electricity.

ACAAA has submitted a list of NEBs and their estimated costs to the PWC from a worksheet prepared for Massachusetts. While the methodology for these estimates will be presented at a later time, it does indicate that more estimates are possible at the individual state level.

To date, these models have been used primarily to: 1) distinguish the direct and indirect pollution effects among the various energy types – coal, natural gas, wind, etc. – and 2) estimate the life-cycle emissions profile of a specific technology, such as the CT peaker capacity described in this report.[18] The models can be applied further and have the ability to estimate dollar savings for certain NEBs when electricity generation is replaced by EE measures.

Table 4 reviews a number of NEBs under the standard headings of utility, customer, and societal impacts. Under this taxonomy, a "yes" indicates that we have reviewed the model's output and believe that it may be used to generate estimates of dollar savings for the NEBs in that column. On the other hand, a "no" indicates that we do not believe at present that it may be used for that purpose.

The first set of impacts relates to utility and consumer impacts and shows a mixture of possibilities for estimates of dollar savings. The second set of NEBs relates to societal issues and economic development amenities such as lower taxes and improved business

[18] An example of the first analysis is contained in HISTECON Associates, Inc. *Utility Avoided Costs in Arkansas: Present and Future Implications For Developing Renewable Energy*, Arkansas Advanced Energy Association, May 2012.

competitiveness (page two of the table). Using a carefully constructed composite of any IOU's profile, most of these effects from increased EE could be estimated as the difference between a base case of increasing power generation and the benefits from a reduction in customer demand.

The recent Synapse report noted that:

> It is important to recognize that including OPIs in the Societal Cost and TRC Tests is likely to expand the universe of efficiency resources that are deemed cost-effective and may lead to increased energy efficiency budgets, or in the case of limited efficiency budgets, it may result in the adoption of a different, more expensive mix of efficiency measures.[19]

In this regard, we agree with ACAAA in concluding that: 1) more NEBs should be included in the EE calculations for the state, and 2) Arkansas customers are affected negatively to the extent that NEBs are underrepresented in the Av.C process.

[19] Synapse Energy Economics, *Energy Efficiency Cost-Effectiveness Screening*, 2012, p. 6.

Table 4. Taxonomy of "Non-Economic Benefits" and Measurable Costs*
Using REMI and EIO-LCA Models

		Types of NEB Costs:								
		Utility		*Customers*				*Society*		
		A/R; fewer shutoffs	*Compliance Costs*	*Lower bills*	*Health /safety costs*	*Increased Comfort*	*Increased Property Values*	*Reduced Emissions*	*Public Health*	*Other Ec.Dev*
Energy	*Technology*									
Coal	*IGCC/CCs*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*
Coal	*Advanced Pulverized*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*
NG	*Conventional NGCC*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*
Wood	*25 Biomass CC Plants*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*
Com.Turbine	*Natural gas fired*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*
Wind	*25 Biomass CC Plants*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*(see p.2)*

* Also known as Other Program Impacts (OPIs)

Table 4 (cont.). Taxonomy of "Non-Economic Benefits" and Measurable Costs**
Using REMI and EIO-LCA Models

		Types of NEB Costs				
		Society: Economic Development				
		Attract and retain businesses	Create local employment	Lower tax bills	Increased Property Values	Improve business competitiveness
Energy	Technology					
Coal	IGCC/CCs	Yes	Yes	Yes	Yes	Yes
Coal	Advanced Pulverized	Yes	Yes	Yes	Yes	Yes
NG	Conventional NGCC	Yes	Yes	Yes	Yes	Yes
Wood	25 Biomass CC Plants	Yes	Yes	Yes	Yes	Yes
Combined Turbine	Natural gas fired	Yes	Yes	Yes	Yes	Yes
Wind	25 Biomass CC Plants	Yes	Yes	Yes	Yes	Yes

** Other examples of OPIs are listed in the following report: Skumatz Economic Research Associates, *Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low Income Program Analyses in California*, Sempra Utilities, May 2010. See also the spreadsheet on Massachusetts NEBs supplied by ACAAA to the PWC.

Respectfully submitted,

/s/ Nate Coulter
Arkansas Bar No. 85034
Wilson Engstrom Corum & Coulter
200 River Market Ave., Suite 600
P.O. Box 71
Little Rock, AR 72203
(501) 375 6453
Email: nate@wecc-law.com
Attorneys for Arkansas Advanced Energy Association, Inc.

CERTIFICATE OF SERVICE

I hereby certify that on May 15, 2013 I electronically filed the foregoing with the Clerk of the Arkansas Public Service Commission through the electronic filing system and will provide the foregoing to all parties of record.

/s/ Nate Coulter
Nate Coulter