



## **APPENDIX K**

# **Energy Efficiency as a Regional Haze Reduction Strategy**

Division of Environmental Quality

Office of Air Quality

## **Executive Summary**

Under the Regional Haze Program, the states are required to submit a state implementation plan (SIP) for each ten year period to detail a strategy for reducing visibility impairing pollutants—including sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and fine particulate matter (PM<sub>2.5</sub>)—that impact certain designated national parks and wilderness areas. These areas are referred to as Class I areas. In Arkansas, the largest sources of visibility impairing pollutants are large electric generating units (EGUs).

Traditionally, the Regional Haze program has focused on retrofit technologies to reduce visibility impairing pollutants. Retrofitting existing EGUs with newer pollution control equipment is a substantial investment and may be less economically efficient than considering alternatives that avoid emissions altogether. In addition, utilities make long-term plans regarding their generation assets, which may include retirement of certain EGUs that would occur long before the expiration of a retrofit control's useful life. Furthermore, Arkansas investor-owned utilities implement energy efficiency programs that reduce the emissions of visibility impairing pollutants. Therefore, the Division of Environmental Quality (DEQ) is including emission reductions from these programs in the State's long-term strategy for the Regional Haze SIP revision for Planning Period II.

In Arkansas, the Arkansas Public Service Commission (APSC) requires all investor-owned electric utilities to propose, administer, and implement cost-effective energy efficiency (EE) programs within their service territories to meet the Energy Efficiency Resource Standard (EE Resource Standard). These EE programs put downward pressure on electricity load demand resulting in avoided generations and avoided emissions of visibility impairing pollutants. APSC and DEQ (collectively "the Agencies") have been working with the Regulatory Assistance Project (RAP) to account for the visibility benefits of Arkansas's EE Resource Standard in Arkansas's long-term strategy for Regional Haze Planning Period II.

The Agencies' analysis projects that the EE programs implemented by Arkansas investor-owned utilities will result in emissions reductions for visibility impairing emissions increasing each year between 2021 and 2028 in Arkansas and in states throughout the Southeast and Lower Midwest regions. The estimated emissions reductions were determined using EPA's AVOIDed Emissions and geneRation Tool (AVERT). Based on the analysis, DEQ projects that, in 2028, Arkansas's EE programs will reduce annual emissions of SO<sub>2</sub> by 1450.6 tons, NO<sub>x</sub> by 1478.18 tons, and PM<sub>2.5</sub> by 149.71 tons across the lower Midwest and Southeast.

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## ACCOUNTING FOR ENERGY EFFICIENCY MEASURES IN REGIONAL HAZE PLANNING

### I. Introduction

In 1977, Congress added § 169 to the Clean Air Act (CAA), which set forth the following goal for restoring pristine conditions in national parks and wilderness areas:

Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution.

In 1999, EPA promulgated the “Regional Haze Regulations: Final Rule” (also referred to as the Regional Haze Rule) to address the combined visibility effects of various pollution sources over a wide geographic region with the goal of achieving natural visibility conditions at designated Class I areas<sup>1</sup> by 2064. The Regional Haze Rule was amended in 2005 and 2017.<sup>2</sup> This program requires all states, including those that do not have Class I areas to participate in planning, analysis, and emission control programs to reduce visibility impairment in Class I areas caused by anthropogenic sources of emissions in compliance with the Regional Haze Rule. States with Class I areas are required to conduct certain analyses to establish goals for each Class I area in the state to improve visibility on the most impaired days and to ensure no degradation occurs on the clearest days. These goals and the long-term strategies to achieve these goals are to be included in SIPs covering each ten-year period leading up to 2064.

DEQ is the regulatory agency obligated to develop and maintain Arkansas’s Regional Haze SIP. Moving forward, the Agencies seek to explore creative avenues in pollution control for state plans and goals, including taking into account in SIPs the emission reductions achieved by EE programs in the state. EPA encourages innovation in the use and inclusion of voluntary measures in SIPs in EPA guidance.<sup>3</sup>

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<sup>1</sup> Class I areas include specifically designated national parks and wilderness areas. A complete list of designated Class I areas can be found at <https://www.epa.gov/visibility/list-areas-protected-regional-haze-program>.

<sup>2</sup> “Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations” (70 FR 39104, July 6, 2005) and

“Protection of Visibility: Amendments to Requirements for State Plans” (82 FR 3078, January 10, 2017)

<sup>3</sup> *Incorporating Voluntary Stationary Source Emission Reduction Programs Into State Implementation Plans—Final Policy (Memorandum)*, John Seitz, Director U.S. EPA – Office of Air Quality Planning and Standards, no date (est. 1998-2001): [https://www.epa.gov/sites/production/files/2016-02/documents/voluntary\\_stationary\\_source.pdf](https://www.epa.gov/sites/production/files/2016-02/documents/voluntary_stationary_source.pdf) and

*Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)*, U.S. EPA - Office of Air and Radiation, September 2004:

[https://www.epa.gov/sites/production/files/2016-02/documents/emerging\\_vol\\_measures.pdf](https://www.epa.gov/sites/production/files/2016-02/documents/emerging_vol_measures.pdf)

and *Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans*, U.S. EPA – Office of Air Quality Planning and Standards Outreach and Information Division, July 2012: [https://www.epa.gov/sites/production/files/2016-05/documents/eermanual\\_0.pdf](https://www.epa.gov/sites/production/files/2016-05/documents/eermanual_0.pdf)

In Arkansas, electric and natural gas utilities are implementing substantial EE programs. The success of these programs has resulted in increasingly higher savings standards (as measured by reduced electricity sales) for each three-year program period. The avoided generation resulting from these programs has a real and quantifiable impact on emissions from fossil fuel combustion in Arkansas and neighboring states. In this analysis, the Agencies demonstrate how EE programs implemented by EGUs are a meaningful component of the State’s long-term strategy.

## **II. Overview of Arkansas’s Energy Efficiency Resource Standard**

### **A. Implementation of the Arkansas Energy Efficiency Resource Standard**

The APSC has authority granted by the Arkansas General Assembly to regulate the service and rates of those utilities subject to its jurisdiction. The APSC's main purpose is to ensure that utility service in the State is “safe and adequate and that rates are just and reasonable.”<sup>4</sup> The Arkansas Energy Conservation Endorsement Act of 1977 also grants authority for the APSC to “engage in energy conservation programs, projects, and practices which conserve, as well as distribute, electrical energy and supplies of natural gas, oil, and other fuels.”<sup>5</sup> Specific to energy conservation, the Act provides the APSC the authority to “propose, develop, solicit, approve, require, implement, and monitor” EE programs “by utility companies.”<sup>6</sup>

On January 11, 2007, the APSC adopted the Rules for Conservation and Energy Efficiency Programs, which were most recently revised on January 19, 2018 (effective April 20, 2018). These Rules outline requirements for electricity and natural gas providers to include EE measures in future planning and annual reporting. Investor-owned utilities must file an Energy Efficiency Portfolio (EE Portfolio) plan for APSC’s approval that addresses programs for all customer classes, and utilities are then required to administer and implement the approved EE Portfolio programs. These proposals must outline “in qualitative and quantitative terms” how the plan will accomplish aspects of the following objectives and benefits:

- Energy savings directly attributable to program activities;
- Long-term and permanent changes in behavior, attitudes, awareness, and knowledge about energy savings and the use of energy efficient technologies in order to achieve energy savings;
- Permanent peak electric demand reduction;
- Energy cost savings and cost-effectiveness;
- Reliability enhancements;
- Energy security benefits;
- Environmental benefits;
- Economic development/competitiveness benefits;

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<sup>4</sup> <http://www.apscservices.info/commission-history.asp>

<sup>5</sup> Ark. Code Ann. §§23-3-401 to 405.

<sup>6</sup> Ark. Code Ann. § 23-3-405(a)(1)-(2).



- Increases in system-wide capacity;
- Accelerating the commercialization of advanced or emerging technologies;
- Improving affordability of energy for all customers; and
- Implementing programs in an efficient manner.<sup>7</sup>

EE Portfolio plans must include quantitative benefits and costs of different aspects of programs, and must provide estimates EE potential and expected demand savings. Proposed plans must include program initiatives for at least one year, up to three years.<sup>8</sup>

To ensure accountability, EE Portfolio plans must include specific Evaluation, Measurement, and Verification (EM&V) procedures used to determine the effectiveness of the program against proposed objectives.<sup>9</sup> The Rules for Conservation and Energy Efficiency Programs require that utilities “use an evaluation period of either ten years (a gas utility may use an evaluation period of fifteen years), or the actual lifetime for each measure in a program to evaluate a program or program portfolio.”<sup>10</sup> Utilities must use an independent program evaluator (IE) to generate EM&V for annual reports, using methods in accordance with the APSC’s Arkansas Technical Reference Manual.<sup>11</sup> Further, the APSC employs an Independent Evaluation Monitor (IEM) to verify annual reports and plan updates submitted by utilities. The Program Year (PY) for EE Portfolio program annual evaluation and reporting runs from January 1 through December 31.

APSC regularly evaluates EE targets. Initially, during the Quick Start phase of implementation (2007–2009), utilities implemented low-cost/high-impact programs, such as residential and commercial energy audits, low- and no-cost weatherization measures for ratepayers, and public education efforts aimed at promoting efficient use of electricity and gas resources.<sup>12</sup> This phase saw the creation of the Arkansas Weatherization Program (AWP) and the Energy Efficiency Arkansas programs, which were paramount in driving public participation in EE programs throughout the state.<sup>13</sup> Utilities funded both programs as part of their EE Portfolios, and these programs were independently operated: AWP was delivered through the Central Arkansas Development Council, and Energy Efficiency Arkansas through the Arkansas Energy Office (AEO), which is now part of the Arkansas Department of Energy and Environment. These two program providers supplied annual calculations for energy reductions independent of reported savings by utility EE Portfolios.

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<sup>7</sup> Docket No. 10-101; April 20, 2018, [http://www.apscservices.info/Rules/energy\\_conservation\\_rules\\_06-004-R.pdf](http://www.apscservices.info/Rules/energy_conservation_rules_06-004-R.pdf)

<sup>8</sup> *Id.*

<sup>9</sup> Docket 10-100-R; August 31, 2017, <http://www.apscservices.info/EEInfo/TRMV8.0.pdf>

<sup>10</sup> Docket No. 10-101; April 20, 2018

<sup>11</sup> Docket 10-100-R; August 31, 2017

<sup>12</sup> Utilities’ EE Portfolio annual reports and worksheets, 2011-2017:

<http://www.apscservices.info/eeAnnualReports.aspx>

<sup>13</sup> Arkansas Weatherization Program Annual Report, 2015; [http://www.apscservices.info/pdf/07/07-079-TF\\_157\\_1.pdf](http://www.apscservices.info/pdf/07/07-079-TF_157_1.pdf)

APSC approved continuation of the AWP through 2014, while directing the utilities to participate in a “weatherization collaborative” that would develop “uniform whole house program offerings for all residential customers, including those in severely energy inefficient homes.”<sup>14</sup> The uniform weatherization program was approved by APSC on December 9, 2014.<sup>15</sup> This program, directed and implemented by utility providers, became part of the utilities’ three-year EE Portfolio beginning in PY 2016, replacing the AWP. The uniform weatherization program serves all residential customers, with the utilities paying up to an average of \$3000 per home for weatherization services, which has reduced the cost share from residents, and over time, is expected to result in higher customer participation rates in EE Portfolio programs.<sup>16</sup> The Energy Efficiency Arkansas program is an ongoing energy education program sponsored and funded jointly by the gas and electric utilities of Arkansas. The purpose of Energy Efficiency Arkansas is to provide fuel neutral information, education, and training that encourages the people and businesses of Arkansas to consume less energy through EE and conservation measures.<sup>17</sup>

In PY 2009, APSC set energy-savings targets for utilities, and established incentives to encourage utilities to surpass baseline goals:

On December 10, 2010, the [APSC] issued a series of orders governing energy efficiency matters, including requiring utilities beginning in 2012 to move from Quick Start to comprehensive programs and portfolios that meet a “Comprehensiveness Checklist” adopted by Order No. 17 in Docket No. 08-144-U and allowing utilities to earn shareholder performance incentives for meeting or exceeding energy-savings targets (based on reductions in kWh sales against a baseline year), as provided by Order No. 15 in Docket No. 08-137-U. The targets were set (for electric utilities) at 0.25% of 2007 sales for PY 2008, and grew in ensuing years to 0.50%, then 0.75%, 0.90%, 1.0%, and recently were raised to 1.2% of 2018 sales for the next 3-year planning cycle (2020–2022).<sup>18</sup> (*emphasis added*)

In 2013, the 89th General Assembly of Arkansas codified Act 253 at Ark. Code Ann. § 23-3-405 (c)–(e), allowing the APSC to grant exemptions for large industrial sources and public institutions. These sources may opt out of EE Portfolio programs offered through their utility

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<sup>14</sup> Arkansas Weatherization Program Annual Report, 2015; [http://www.apscservices.info/pdf/07/07-079-TF\\_157\\_1.pdf](http://www.apscservices.info/pdf/07/07-079-TF_157_1.pdf)

<sup>15</sup> APSC Docket 13-002-U, Order No. 22; page 11, December 9, 2014

<sup>16</sup> Arkansas Weatherization Program (AWP) Annual Report, 2015: Highlights section; [http://www.apscservices.info/pdf/07/07-079-TF\\_157\\_1.pdf](http://www.apscservices.info/pdf/07/07-079-TF_157_1.pdf)

<sup>17</sup> Summarized from Energy Efficiency Arkansas (EEA) 2017 Annual EE Report, <http://www.apscservices.info/EEInfo/EEReports/EEA%202017.pdf> and from EEA Website: <http://energyefficiencyarkansas.org/index.html>

<sup>18</sup> Quoted from “A Brief History of Arkansas’s Energy Efficiency Initiatives (2006 to date) and Rules Governing Evaluation, Measurement & Verification of Energy Savings: Wally Nixon, APSC. *Emphasis added.*”

providers. This statute allows for innovative and independent EE program development by exempted entities, authorizing them to implement programs that are self-directed. Exemptions by APSC are granted only in the instance self-directed program plans produce at least the same EE benefits for the utility system as if the entity was participating in the EE Portfolio programs directed by the service utility.

### **B. Quantification of Energy Savings from APSC Energy Efficiency Resource Standard**

Because APSC sets annual energy savings goals for utilities' EE Portfolios and the structure for EE Portfolios to meet and exceed the savings goals is incentive-based, accurate and quantified data to evaluate program effectiveness is necessary and reliably provided. The utilities rely on the Technical Reference Manual to show that their programs are on-track to receive incentive payouts, and the APSC relies on the Technical Reference Manual to effectively assess programs to show real and quantified energy savings before rewarding providers. The calculations within the Technical Reference Manual provide a reliable estimation of avoided energy consumption.

The Technical Reference Manual is updated regularly to account for new technologies and best practices in EE, and is referenced from initial development of EE programs through EM&V processes by APSC's IEM. The Technical Reference Manual is reviewed annually by APSC and their appointed IEM, and by utilities and their IEs. Reduced energy demand from programs administered under APSC's Rules are calculated using protocols recognized by the American National Standards Institute ("ANSI"), the American Society of Heating, Refrigerating and Air-Conditioning Engineers ("ASHRAE"), and the Illuminating Engineering Society of North America (IESNA). Technical resources referenced in the Technical Reference Manual also include equations and protocols published by the U.S. Department of Energy's Energy Efficiency and Renewable Energy Office, and EPA's EnergyStar® strategies for buildings and industrial plants. The Arkansas Technical Reference Manual, Version 8.1, was most recently updated in December 2019.

Trends in energy and demand savings show the benefits of implementing an incentive-based structure for utilities' EE Portfolios (see Tables 1–3 below). Before the incentive was introduced, utility EE Portfolios came close to or reached the goal set by PSC; for the largest utilities, every year after shows an increased average exceedance of the goal, as utilities adjust their EE Portfolio programs to be more effective. In PY 2017, SWEPCO exceeded the goal by forty-one percent, Entergy exceeded the goal by sixty-five percent, and OGE, a smaller electric provider in the state, exceeded the goal by seventeen percent. Utilities and their investors see real benefits in EE, and in Arkansas, have committed to continued improvement of system-wide efficiency. These efforts amounted to an energy savings of 319,790 MWh and a demand reduction of 124.6 MW in 2017. Higher levels of energy savings are expected due to the increased EE target starting in 2020 and as the utilities implementation experience with these programs increases.

**Table 1: Net Evaluated Annual Energy & Demand Savings, Entergy (Southeast Region), 2011–2017** <sup>19</sup>

Program Year	Energy Savings Goal %	Net Energy Savings Goal (MWh)	Net Energy Saved (MWh)	Percent of Goal	Energy Demand Avoided Achieved (MW)
2011	0.25	40,227	39,967	99%	
2012	0.50	96,694	107,627	111%	
2013	0.75	139,622	188,468	135%	
2014	0.75	135,738	205,507	151%	
2015	0.90	162,886	230,341	141%	75.0
2016	0.90	161,478	253,290	157%	92.5
2017	0.90	160,484	264,992	165%	104.4

**Table 2: Net Evaluated Annual Energy & Demand Savings, SWEPCO (Lower Midwest Region), 2011–2017** <sup>20</sup>

Program Year	Energy Savings Goal %	Net Energy Savings Goal (MWh)	Net Energy Saved (MWh)	Percent of Goal	Energy Demand Avoided Achieved (MW)
2011	0.25	10,426	11,855	113%	
2012	0.50	15,714	15,714	100%	
2013	0.75	23,093	25,388	110%	
2014	0.75	21,339	30,055	141%	
2015	0.90	24,273	31,356	129%	15.9
2016	0.90	23,958	34,356	143%	14.0
2017	0.90	23,872	33,667	141%	12.7

**Table 3: Net Evaluated Annual Energy & Demand Savings, OGE (Lower Midwest Region), 2011-2017** <sup>21</sup>

Program Year	Energy Savings Goal %	Net Energy Savings Goal (MWh)	Net Energy Saved (MWh)	Percent of Goal	Energy Demand Avoided Achieved (MW)
2011	0.25	6,753	4,985	74%	

<sup>19</sup> Utilities' EE Portfolio annual report workbooks, 2011-2017: <http://www.apscservices.info/eeAnnualReports.aspx>

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

2012	0.50	11,364	7,596	66%	
2013	0.75	16,844	13,411	80%	
2014	0.75	16,288	13,794	85%	
2015	0.90	18,904	20,543	117%	3.1
2016	0.90	18,623	23,257	125%	3.4
2017	0.90	18,058	21,131	117%	3.5

**Table 4: Net Evaluated Annual Energy & Demand Savings, Empire (Lower Midwest Region), 2011-2015** <sup>22</sup>

Program Year	Energy Savings Goal %	Net Energy Savings Goal (MWh)	Net Energy Saved (MWh)	Percent of Goal	Energy Demand Avoided Achieved (MW)
2011	0.25	387	3	1%	
2012	0.50	777	151	19%	
2013	0.75	1,077	177	16%	0.05
2014	0.75	1,170	147	13%	0.04
2015	0.90	1170	212	18%	0.05

### C. Expected Useful Life of Energy Efficiency Measures

For each program in an EE Portfolio, data is included to show annual and lifetime savings associated with specific measures implemented for each program. For instance, in Entergy's 2017 EE Portfolio, the Home Energy Solutions program evaluated 25,757 megawatt hours (MWh) of energy savings and a ten megawatt (MW) reduction in energy demand for PY 2017.<sup>23</sup> The lifetime savings, calculated based on useful life of measures installed under the program in PY 2017, will produce 421,459 MWh of energy savings. The majority of implemented measures under EE Portfolios have long-term benefits, which cumulatively reduce load resulting in less combustion of fossil fuels from EGUs and consequently reduced air emissions.

The Technical Reference Manual outlines technical methods for calculating savings for the following EE measures as part of utilities' EE Portfolios:

- a. Residential Deemed Savings, Installation and Efficiency Standards, including:
  - i. HVAC measures,
  - ii. Building envelope measures,
  - iii. Domestic hot water measures,
  - iv. Appliance replacements, and
  - v. Lighting upgrades;

<sup>22</sup> Utilities' EE Portfolio annual report workbooks, 2011-2017: <http://www.apscservices.info/eeAnnualReports.aspx>

<sup>23</sup> Entergy Arkansas, Inc., Arkansas Energy Efficiency Program Portfolio Annual Report: Docket No. 07-085-TF 2017 Program Year: <http://www.apscservices.info/EEInfo/EEReports/Entergy%202017.pdf>

- b. Commercial, Industrial, and Small Commercial Deemed Savings, Installation and Efficiency Standards, including:
  - i. HVAC measures,
  - ii. Building envelope measures,
  - iii. Domestic hot water measures,
  - iv. Motors,
  - v. Appliances replacements,
  - vi. Lighting upgrades,
  - vii. Other methods, and
  - viii. Food service equipment.

For each of these categories, the Technical Reference Manual provides calculations to account for remaining useful life (RUL) of equipment replaced and the estimated useful life (EUL) of newly implemented EE measures to account for annual and lifetime energy use reductions.<sup>24</sup> The combined average useful life for these measures is thirteen and one-half years, meaning the system-wide benefits of energy savings and the reduction of energy costs for the customer continue long after initial investment and installation.

#### **D. Timing of Implementation of EE Measures**

APSC rules require that each investor-owned utility file its Annual Report and Excel Workbook in May of each year, which provides information on the energy program savings planned, budgeted, and achieved [for the prior PY], and then evaluated and verified by independent program evaluator. These reports, including the evaluators' reports, are available in each utility's EE docket [...].<sup>25</sup> The timing for implementation of individual EE Portfolio measures is largely determined by the success (or low performance) of specific EE Portfolio programs and the associated goals for each program. For instance, a program within an EE Portfolio that does not have expected participation rates will be evaluated in the Annual Report for the past PY; if a feasible means of increasing participation within that program cannot be projected forward, the program will be retired, replaced with a new program, or its budget transferred to a more successful program in the EE Portfolio (with approval from ASPC). Programs and associated EE measures identified for the upcoming PY will begin (at the earliest) in January, and to be included in the EM&V for that PY, must be completed by December of the same year; successful programs often are continued through several PYs, but reporting for each PY is bound to January through December. Updated comprehensive EE Portfolio plans must be filed April 1 for the following PY.<sup>26</sup>

EE programs are prescriptive and are evaluated annually for achievement and ongoing performance.

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<sup>24</sup> Arkansas Technical Reference Manual, Version 7.0, August 31, 2017: <http://www.apscservices.info/EEInfo/TRMv7.0.pdf>

<sup>25</sup> Quoted from "A Brief History of Arkansas's Energy Efficiency Initiatives (2006 to date) and Rules Governing Evaluation, Measurement & Verification of Energy Savings: Wally Nixon, Arkansas Public Service Commission

<sup>26</sup> Docket No. 10-101; April 20, 2018

### E. Customer Costs of Energy Efficiency Portfolio Offerings

Commercial and residential customers of utilities are offered zero- and low-cost options through the EE Portfolios and through programs offered through Energy Efficiency Arkansas. These include free weatherization and energy consumption audits, rebates for qualifying energy efficient equipment and appliances, and supplemental federal funding through the U.S. Department of Energy for low-income or severely energy-inefficient buildings. Unlike traditional source-specific controls, EE measures ultimately reduce utility costs to the consumer. Some programs, such as those replacing older bulbs with CFL or LED, are fully funded by the EE Portfolio, and the customer will see immediate benefits in terms of monthly energy costs.

For EE Portfolio programs offered through Arkansas's utilities, customers can expect reasonable payback periods for their investments. For instance, for a retrofit lighting project for commercial and industrial customers with a peak demand of more than 50 kW, the average payback period is two and one-half years for an investment of \$23,000.00.<sup>27</sup> Table 5 below shows equipment for a commercial lighting retrofit; after the initial investment by the customer, the utility EE Portfolio program incentive would pay back approximately \$9500. The annual energy savings of 68,039 kWh would reduce customer energy costs by \$5400 in the first year, and thereafter. The benefits of the technology implemented in this example would continue to benefit the customer in terms of savings, for approximately twelve and one-half years past the date of payback.

**Table 5: Commercial Retrofit Lighting Scenario**

<b>Existing Lighting</b>	<b>Retrofit Lighting</b>
(60) highbays 400W MH	(60) 180W LEDs
(10) wall packs 250W MH	(10) 75W LEDs
(10) troffers 4 Lamp 32W T8	(10) 50W LEDs

Because of the cumulative energy savings gained per dollar invested in EE programs, these programs are cost-effective in the long-term for utilities and for customers. Additional air quality benefits from these programs are surplus and occur without further costs.

After the payback period for a measure, the EE project continues to provide cost-savings to the customer. Using the commercial lighting scenario from earlier as an example, after the payback period of two and one-half years, the customer would save approximately \$67,500 over the remaining lifetime of the new lights. For residential customers, the savings for EE measures is on a smaller scale, but is proportional to the initial investment, and has comparable EUL. Long-term savings encourages customers to engage in EE Portfolio program offerings, and to continue employing EE measures in daily operations.

Many of the measures implemented under utility EE Portfolios, such as commercial upgrades to LED-compatible ballasts and building envelope/insulation installation, ensure longevity of the

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<sup>27</sup> SWEPCO Annual EE Portfolio Report, 2016: page 700.  
<http://www.apscservices.info/EEInfo/EEReports/SWEPCO%202016.pdf>



public benefits from reduced energy use and the related emissions reductions. Because the benefits transfer to the customer in terms of profit margin and cost savings, there is no incentive to return to less efficient measures. Upgrades made in each program year will continue to offer benefits to the system and the individual customer for many forward-looking years.

## **F. Energy and Non-Air Quality Impacts**

### **1. Grid resiliency and avoided additional generation/transmission**

Energy demand is a key factor affecting grid resiliency, particularly during peak load times. EE measures help to insulate the reliability of the system by providing meaningful demand reductions. Measures implemented in one year provide demand reductions for that PY and continue to provide demand reductions in subsequent years, in addition to new demand-reducing measures implemented with each following PY. Table 6 below illustrates the total MW of energy demand avoided through implementation of EE Portfolio programs in PYs 2015–2017; as with other benefits realized through EE measures, demand avoided increases incrementally over time.

**Table 6: Energy Demand Avoided (MW) Through Utility EE Portfolio Programs, 2015–2017**

<b>Program Year</b>	<b>Southeast Region</b>	<b>Lower Midwest Region</b>	<b>Statewide Total</b>
<b>2015</b>	75.0	19.05	<b>94.05</b>
<b>2016</b>	92.5	17.44	<b>109.94</b>
<b>2017</b>	104.4	16.25	<b>120.65</b>

### **2. Non-Energy benefits of EE measures**

While the primary measure of success for EE Portfolios is the direct savings achieved in energy use and demand, other benefits result from the implementation of these measures. Non-energy benefits include reductions in maintenance, water usage, wastewater needs, and fossil fuel consumption. These benefits can account for increases in health, safety, comfort, property values, and even productivity. Entergy’s EE Portfolio measures that were implemented in PY 2017 will yield a lifetime savings of 291,110,605 gallons of water with an avoided cost of \$1,598,936.<sup>28</sup> For the same year, SWEPCO’s implemented measures will result in a lifetime savings of 32,993,571 gallons of water, saving consumers \$112,282.<sup>29</sup> OG&E provided PY 2017 calculations showing first-year water savings of 9,710,220 gallons of water and \$48,217 from its

<sup>28</sup> Entergy Arkansas, Inc. Arkansas Energy Efficiency Program Portfolio Annual Report, 2017 Program Year <http://www.apscservices.info/EEInfo/EEReports/Entergy%202017.pdf>

<sup>29</sup> Southwestern Electric Power Company Arkansas Energy Efficiency Program Portfolio Annual Report, 2017 Program Year <http://www.apscservices.info/EEInfo/EEReports/SWEPCO%202017.pdf>



EE Portfolio program measures.<sup>30</sup> These are substantial reductions in water use and result in considerable savings for customers that are in addition to primary energy savings benefits.

### **III. Projected Emission Reduction Benefits from the APSC Energy Efficiency Resource Standard (EE Resource Standard) during Planning Period II**

#### **A. EE Resource Standard Energy Savings Projection**

EE measures implemented by electric utilities in Arkansas result in meaningful energy savings and emission reductions. To quantify these savings into the future, the Agencies have projected annual energy sales, incremental energy savings, and cumulative energy savings resulting from EE Portfolio programs.

In this analysis, annual energy sales for 2017 were used to project annual energy sales for each year from 2018 through 2028.<sup>31</sup> Projected sales were based on the annual average growth rate from the U.S. Energy Information Administration's Annual Energy Outlook 2018.<sup>32</sup> The average annual growth rate for both the SERC Reliability Corporation Delta and the Southwest Power Pool South electricity market module regions to which Arkansas belongs is 0.90%.

Projected sales were used to calculate annual incremental and cumulative energy savings for the period of 2018 through 2028. The projected annual incremental savings were calculated based on the EE standard required by the Arkansas Public Service Commission, currently one percent of 2007 sales and 1.2% of 2018 retail sales beginning in 2020. Historic annual incremental savings were based on utility reports to APSC.<sup>33</sup>

Because the estimated useful life of various measures varies, the Agencies utilized a depreciation schedule (see Table 7) for EE measures developed by EPA in calculating emissions reductions using AVERT.<sup>34</sup> Cumulative savings are based on incremental savings for each year added to previous years' savings multiplied by the applicable depreciation factor for each year. Tables 8 and 9 below show the projected cumulative energy savings for EE programs currently in place in Arkansas.

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<sup>30</sup> Oklahoma Gas and Electric Company Arkansas Energy Efficiency Program Portfolio Annual Report, 2017 Program Year <http://www.apscservices.info/EEInfo/EEReports/OG&E%202017.pdf>

<sup>31</sup> 2017 energy sales data were obtained from the U.S. Energy Information Administration, form EIA 861, <https://www.eia.gov/electricity/data/eia861/>

<sup>32</sup> [https://www.eia.gov/outlooks/aeo/tables\\_ref.php](https://www.eia.gov/outlooks/aeo/tables_ref.php)

<sup>33</sup> EE Annual Reports filed by the utilities can be accessed here: <http://www.apscservices.info/eeAnnualReports.aspx>

<sup>34</sup> <http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-ghg-abatement-measures-scenario1.xlsx>  
(RefTables worksheet)

**Table 7: Depreciation Factors Used for Calculating Cumulative EE Savings<sup>35</sup>**

Year	EE Savings % Not Expiring
0	100.00000000000000%
1	94.73684210526320%
2	89.47368421052630%
3	84.21052631578950%
4	78.94736842105260%
5	73.68421052631580%
6	68.42105263157890%
7	63.15789473684210%
8	57.89473684210530%
9	52.63157894736840%
10	47.36842105263160%
11	42.10526315789470%
12	36.84210526315790%
13	31.57894736842110%
14	26.31578947368420%
15	21.05263157894740%
16	15.78947368421060%
17	10.52631578947370%
18	5.26315789473688%

**Table 8: Cumulative Energy Savings for SERC Reliability Corporation, Delta Resulting from EE Programs in Arkansas<sup>36</sup>**

Year	Cumulative Savings (GWh)
2018	1,311.39
2019	1,443.56
2020	1,603.69
2021	1,750.52
2022	1,884.02
2023	2,004.23
2024	2,111.12
2025	2,204.69
2026	2,284.96
2027	2,351.92
2028	2,405.56

<sup>35</sup> Cumulative savings are based on incremental savings for each year added to previous years' savings multiplied by the applicable depreciation factor for each year: <http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-ghg-abatement-measures-scenario1.xlsx> (RefTables worksheet)

<sup>36</sup> *Id.*

**Table 9: Cumulative Energy Savings for Southwest Power Pool, South Resulting from EE Programs in Arkansas<sup>37</sup>**

Year	Cumulative Savings (GWh)
2018	327.27
2019	379.20
2020	433.76
2021	484.18
2022	530.46
2023	572.60
2024	610.61
2025	644.48
2026	674.21
2027	699.80
2028	721.25

#### **B. Emissions Reductions Resulting from EE Resource Standard Energy Savings**

The emissions reductions estimations are limited to those electric-generating utilities voluntarily complying with ASPC’s EE standard, specifically, Entergy Arkansas, Inc. (“Entergy”), Southwestern Electric Power Company (SWEPCO), Oklahoma Gas and Electric (OGE), and Empire District Electric (“Empire”). While many utility providers and cooperatives within the state offer EE programs to customers, these entities’ programs are not subject to ASPC’s verification, monitoring, and reporting requirements. Because the Agencies are interested in only verifiable emissions reductions, those utilities not under jurisdiction of ASPC are excluded from this discussion, though similar regional benefits result from their EE programs, as well. The analysis below is conservative, based on EE data that could be verified.

The Agencies used EPA’s AVERT model to estimate the emissions reductions from Arkansas’s EE programs. AVERT was chosen due to its ability to quantify emission benefits and reduced generation resulting from EE measures. The tool is able to quantify reductions of PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub> from state and multi-state EE measures on the regional, state, and county level within each AVERT region. Additionally the tool allows the user to present information about location-specific emissions benefits in easy-to-interpret tables and maps. Figure 1 below illustrates how the AVERT model divides the nation into ten distinct regions for which avoided generation and reduced emissions can be estimated. Arkansas is split into two regions in the AVERT Model: the Lower Midwest Region and the Southeast Region. Both of the AVERT regions to which Arkansas belong include portions of multiple electricity market module regions.

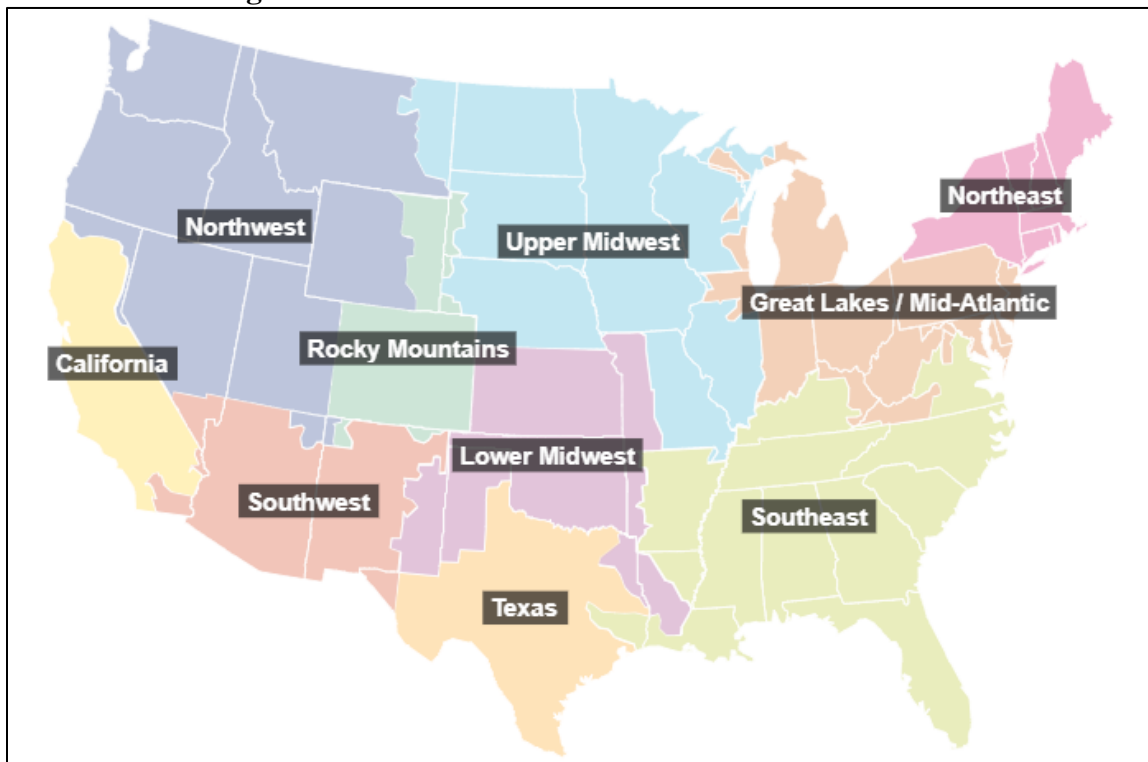
AVERT regions do not correspond precisely to specific electricity market module regions, as shown in Figure 2. Independent System Operators (ISOs) and Regional Transmission

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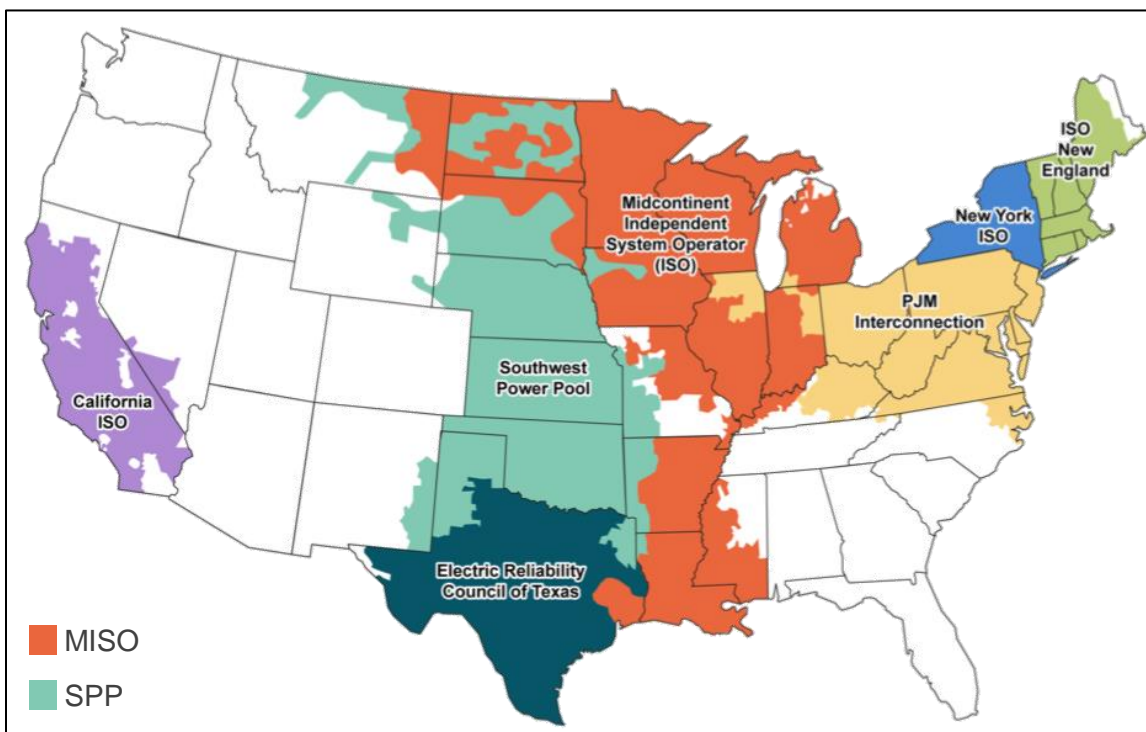
<sup>37</sup> Cumulative savings are based on incremental savings for each year added to previous years’ savings multiplied by the applicable depreciation factor for each year: <http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-ghg-abatement-measures-scenario1.xlsx> (RefTables worksheet)

Organizations (RTOs) are voluntary organizations that plan, operate, dispatch, and provide electricity transmission services within their specific regions. The Federal Energy Regulatory Commission regulates ISO/RTO operations. Entergy participates in the Midcontinent Independent System Operator (MISO). The MISO region extends from the Gulf of Mexico, through portions of the Upper Midwest, and Northern Plains to Canada. MISO territory within Arkansas is assigned to AVERT's Southeast Region. Southwestern Electric Power Company (SWEPCO) participates in the Southwest Power Pool (SPP) RTO. The SPP region extends from northwestern Louisiana, northern Texas, and eastern New Mexico in the south through portions of North Dakota and eastern Montana in the north. SPP territory within Arkansas is assigned to AVERT's Lower Midwest Region.

**Figure 1: AVERT Regions**



**Figure 2: United States Electricity Market Module Regions**



The benefits of the EE programs increase over time as more incremental savings are added and EE measures from previous years continue to produce savings. Therefore, DEQ used the projected cumulative EE energy savings from Arkansas EE programs to estimate annual regional emission reductions in AVERT for SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> for 2021–2028 in each region. DEQ updated the inventory of available EGUs for each year based on known retirements specified in the EPA National Electric Energy Data System (NEEDS) v6 database.<sup>38</sup> These updates do not take into account potential installments of additional renewable energy resources, which could also affect dispatch and therefore emissions in the evaluated years.

Tables 10 and 11 below show estimated annual regional emission reductions resulting from Arkansas EE projects in years 2021 through 2028, which represents the second planning period for the Regional Haze Program.

<sup>38</sup> For example, if the retirement year of an EGU in the Southeast or Lower Midwest AVERT Region was listed as 2025 in the NEEDS v6 database, DEQ removed that EGU from the AVERT inventory for 2026.

**Table 10: Estimated Annual Emission Reductions for the AVERT Southeast Region Resulting from Arkansas EE Measures During the Second Planning Period of the Regional Haze Program**

Year	SO <sub>2</sub> (tons)	NO <sub>x</sub> (tons)	PM <sub>2.5</sub> (tons)
2018	538.42	584.60	64.99
2019	585.09	630.61	70.82
2020	663.92	713.88	79.92
2021	724.62	779.28	87.25
2022	780.78	839.69	94.28
2023	820.05	890.76	99.85
2024	863.71	937.91	105.14
2025	875.16	959.21	107.70
2026	906.99	994.12	111.63
2027	915.69	1019.06	115.20
2028	952.03	1042.43	117.85

**Table 11: Estimated Annual Emission Reductions for the AVERT Lower Midwest Region Resulting from Arkansas EE Measures during the Second Planning Period of the Regional Haze Program**

Year	SO <sub>2</sub> (tons)	NO <sub>x</sub> (tons)	PM <sub>2.5</sub> (tons)
2018	237.20	201.43	15.52
2019	263.09	227.08	17.11
2020	300.48	259.25	19.54
2021	331.48	286.81	21.24
2022	362.69	313.93	23.24
2023	391.21	338.70	25.08
2024	417.07	361.14	26.74
2025	440.23	381.23	28.22
2026	460.71	398.95	29.54
2027	483.42	422.50	30.89
2028	498.57	435.75	31.86

The AVERT model predicts that the estimated emission reductions identified in Tables 10 and 11 will be dispersed throughout each respective region based on least-cost dispatch of available EGUs. Therefore, these reductions have the potential to be beneficial in reducing haze at Class I areas in Arkansas as well as Class I areas in other states.

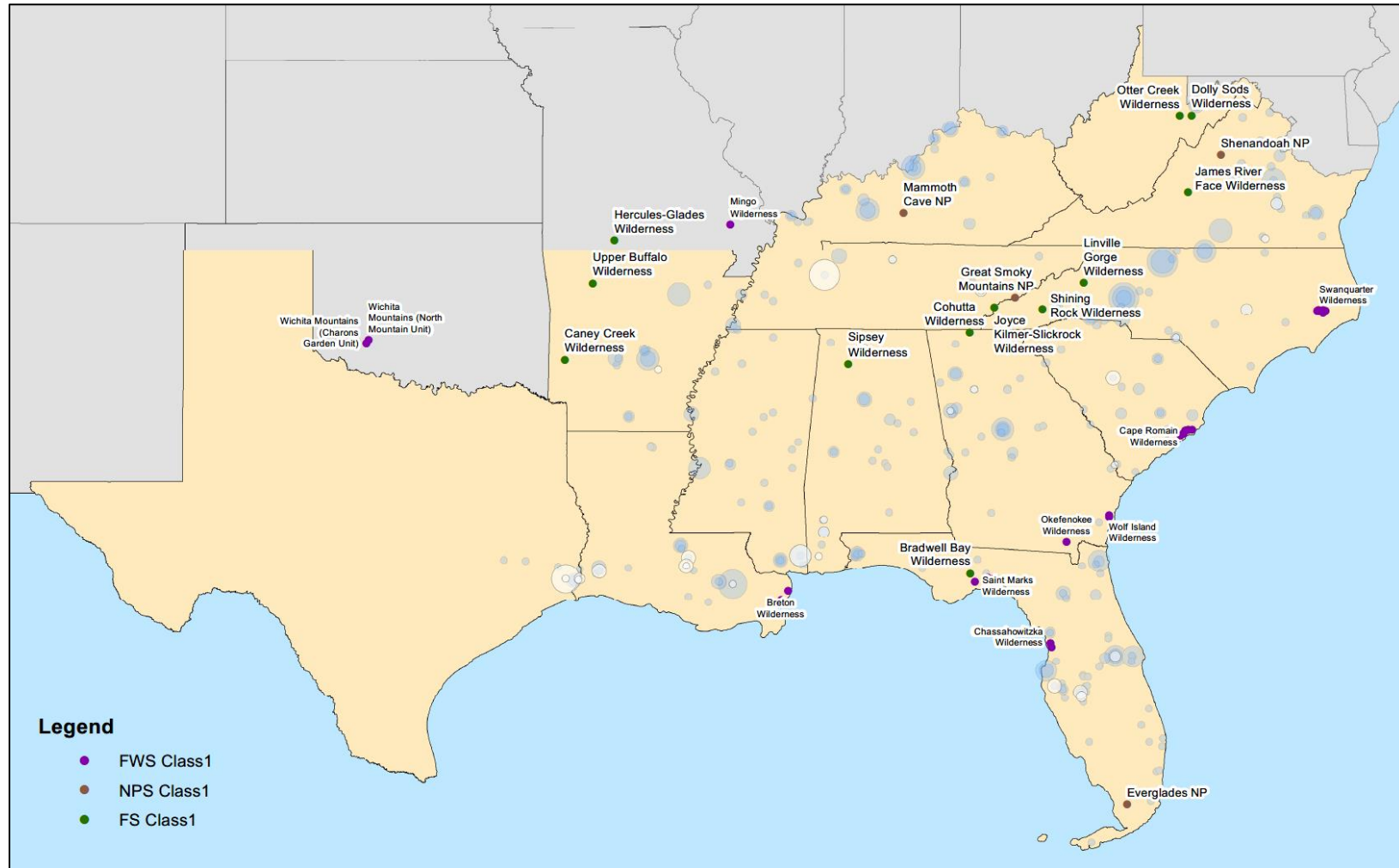
The maps in Figures 3, 4, and 5 below show the magnitude of avoided generation and reduced emissions of SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> from specific units as predicted by AVERT in the AVERT Southeast Region in 2028, the final year of the second planning period for Regional Haze. These savings are based on the reduced load in Arkansas resulting from EE savings in the Entergy market.

**Figure 3: Projected 2028 SO<sub>2</sub> Reductions for the AVERT Southeast Region from Specific Units as Predicted by AVERT<sup>39</sup>**



<sup>39</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.

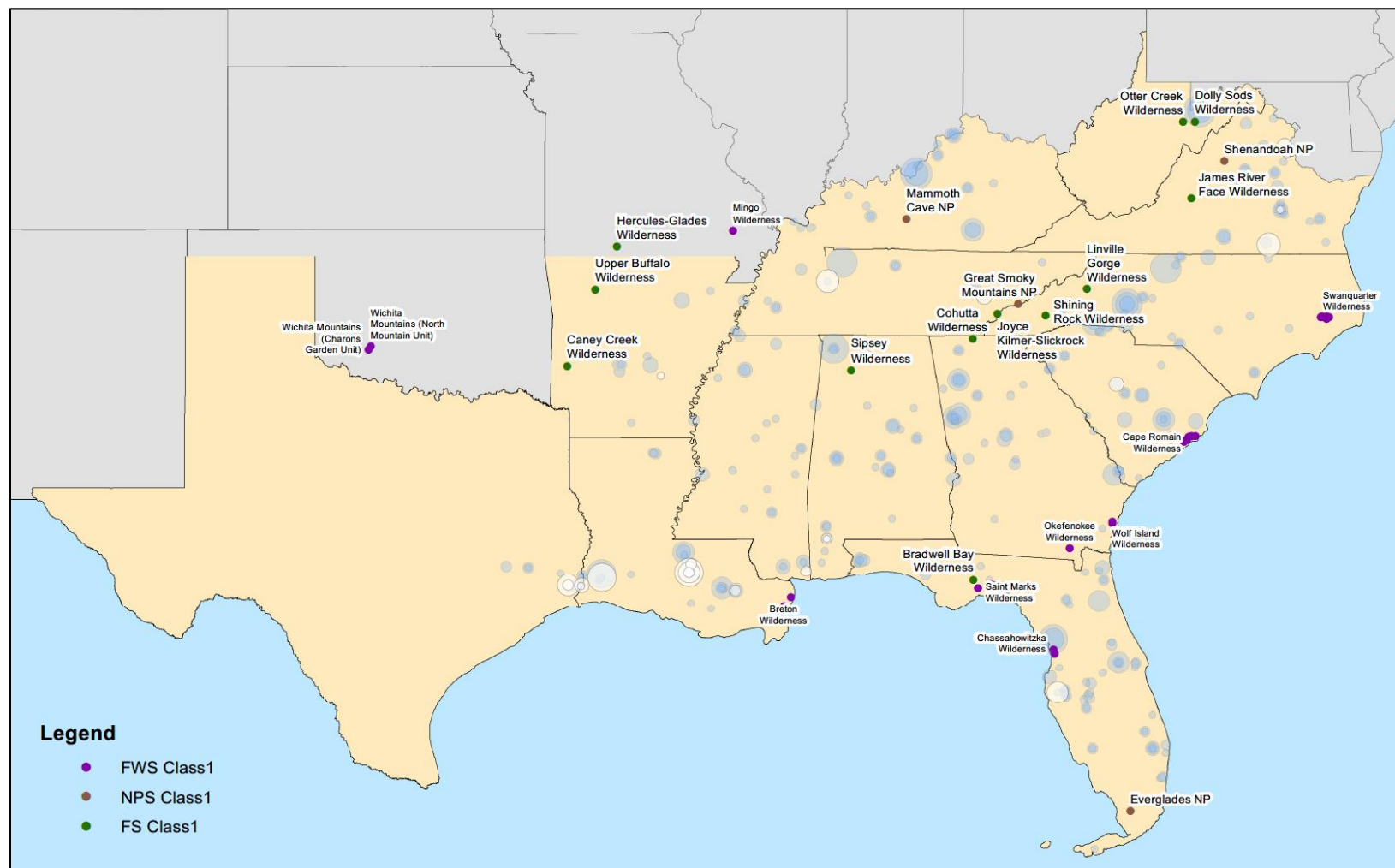
**Figure 4: Projected 2028 NO<sub>x</sub> Reductions from Arkansas EE Programs for the AVERT Southeast Region from Specific Units as Predicted by AVERT<sup>40</sup>**



<sup>40</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.



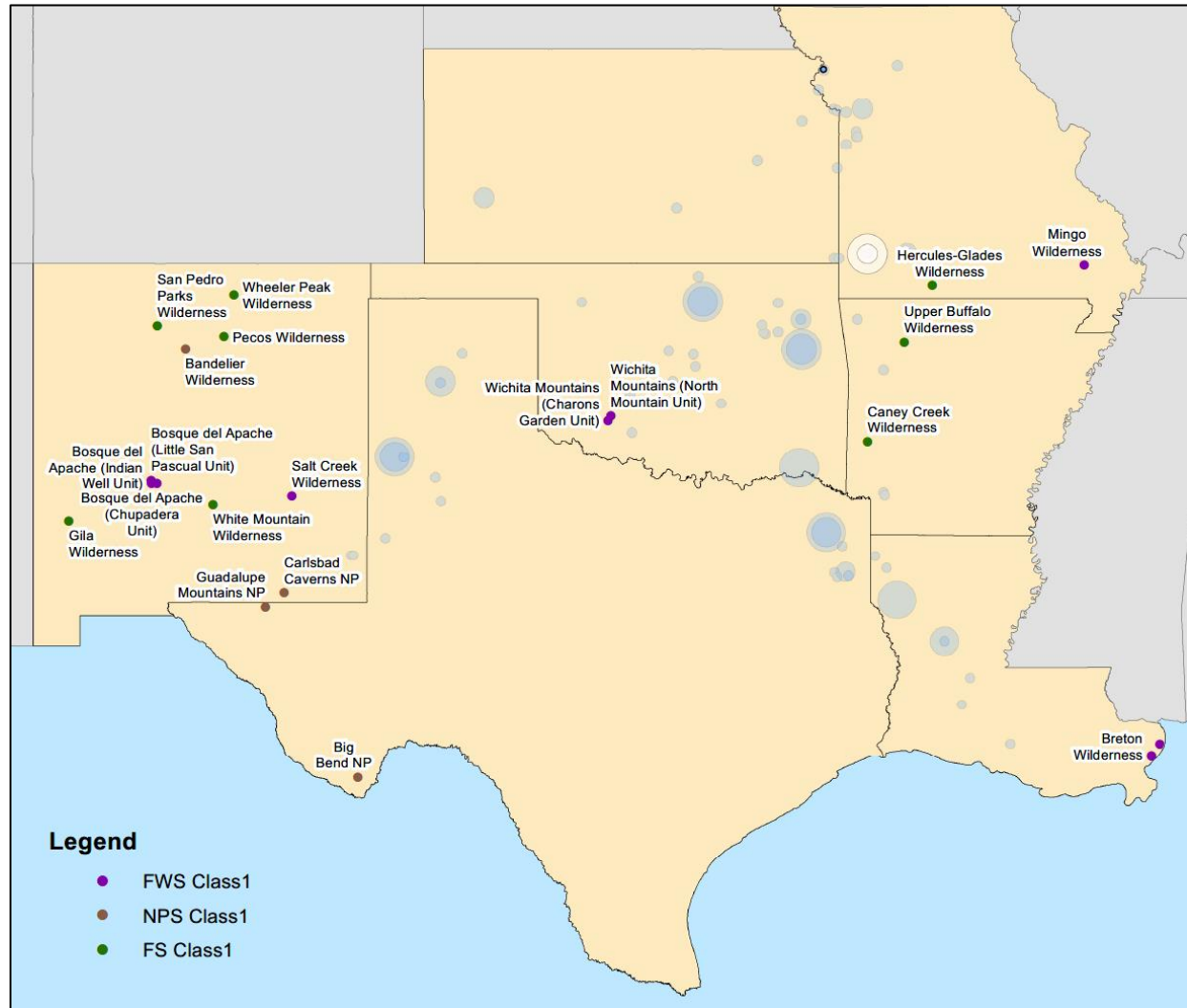
**Figure 5: 2028 PM<sub>2.5</sub> Reductions from Arkansas EE Programs for the AVERT Southeast Region from Specific Units as Predicted by AVERT<sup>41</sup>**



<sup>41</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.

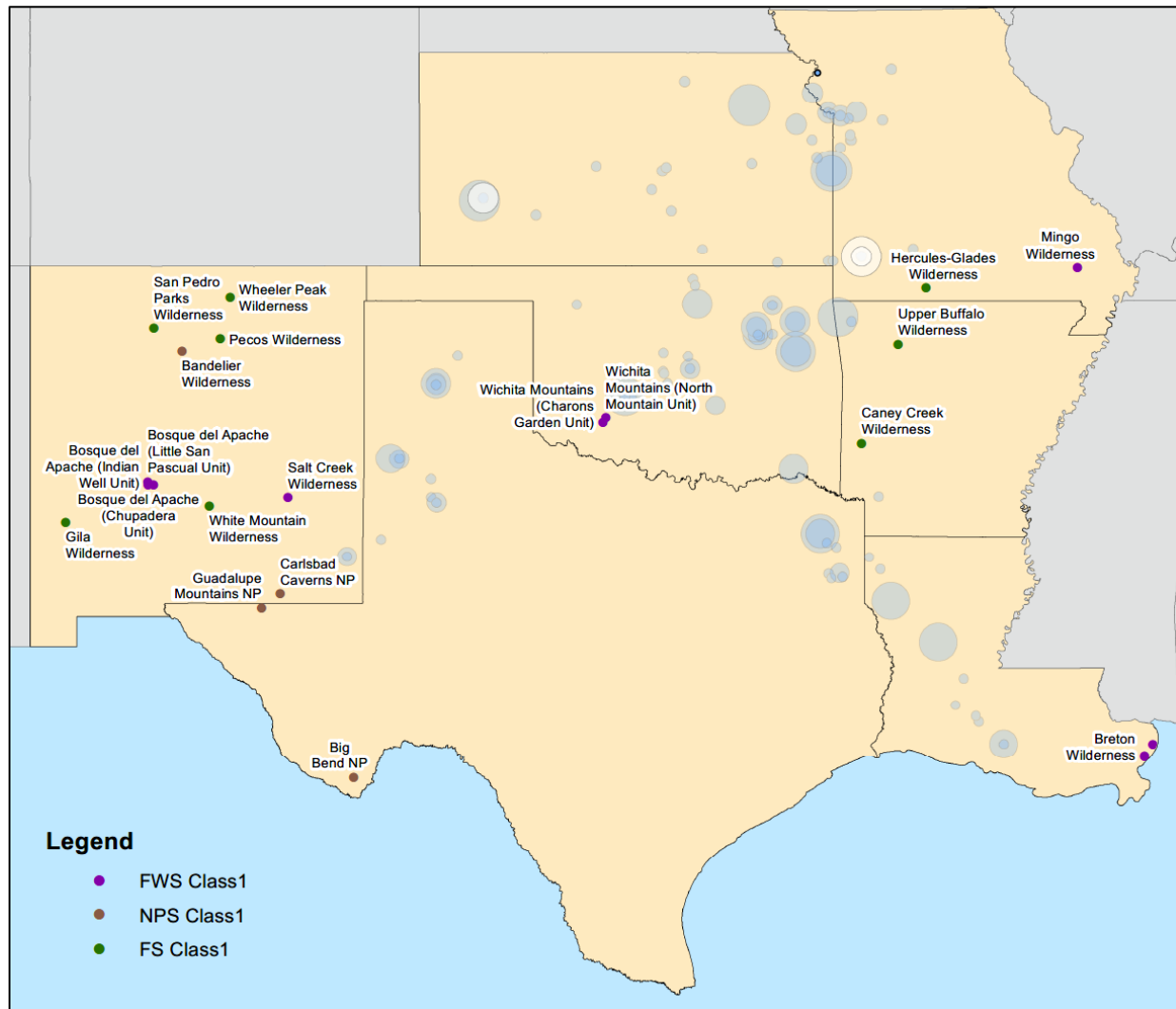
The maps in Figures 6, 7, and 8 below show the magnitude of avoided generation and reduced emissions of SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> in the AVERT Lower Midwest Region in 2028, which is the final year of the second planning period for Regional Haze. These savings are based on the reduced load in Arkansas resulting from EE savings from programs implemented by SWEPCO, Empire, and OGE.

**Figure 6: Projected 2028 SO<sub>2</sub> Reductions from Arkansas EE Programs for the AVERT Lower Midwest Region from Specific Units as Predicted by AVERT<sup>42</sup>**



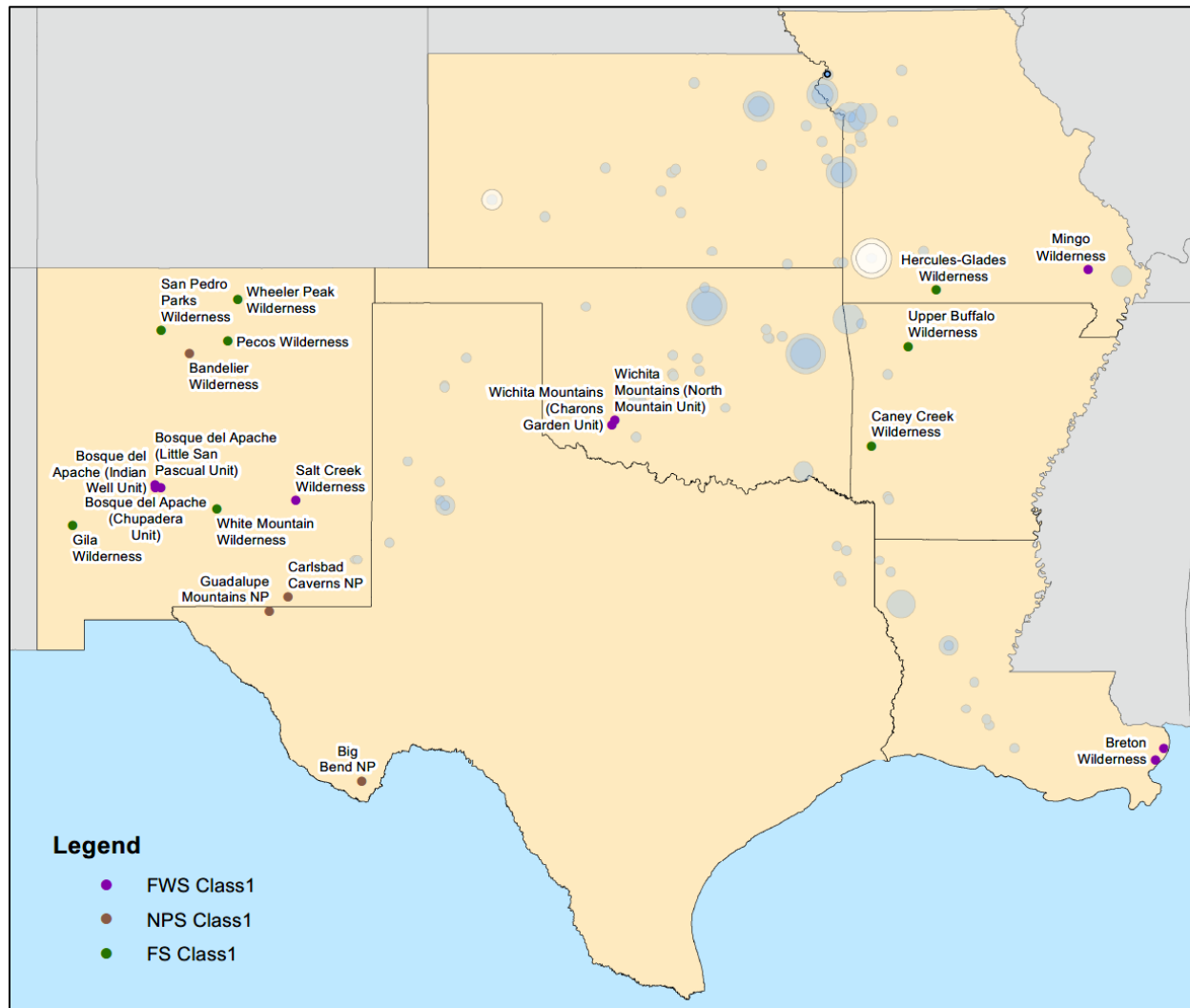
<sup>42</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.

**Figure 7: Projected 2028 NO<sub>x</sub> Reductions from Arkansas EE Programs for the AVERT Lower Midwest Region from Specific Units as Predicted by AVERT<sup>43</sup>**



<sup>43</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.

**Figure 8: Projected 2028 PM<sub>2.5</sub> Reductions from Arkansas EE Programs for the AVERT Lower Midwest Region from Specific Units as Predicted by AVERT<sup>44</sup>**



<sup>44</sup> The diameter of each circle indicates the magnitude of a unit's change in generation/emissions. Circles are semi-transparent: darker areas occur in regions with overlapping units. Negative changes (emissions decreases) are indicated with blue circles; positive changes (emissions increases) are indicated with black-bordered white circles.

#### **IV. Conclusion**

The Agencies' evaluation demonstrates that implementation of Arkansas's EE Resource Standard are expected to reduce emissions of visibility impairing pollutants over a wide geographic area, and thus contribute to visibility progress at Class I areas throughout the Southeast and Lower Midwest. Because the energy savings from APSC-approved EE Portfolios are not required under federal air pollution control rules, federal EE rules, or Arkansas air pollution control rules the emission reductions resulting from these programs are wholly surplus benefits.

Inclusion of Arkansas's EE Resource standard as part of Arkansas's long-term strategy has other benefits including grid resiliency, reduced need for additional generation assets, and reduced costs when compared to traditional environmental control strategies. EE program investments are recoverable through rate adjustments just as retrofit projects, but ratepayers themselves receive real-world energy bill savings from the EE programs that their utility payments subsidize.

The Agencies have confidence in these projected emission reductions because of the robust framework established by APSC to incentivize and verify energy savings from Arkansas investor-owned utilities' EE portfolios. DEQ plans to compare the results of this analysis to actual energy savings reported by utilities and the emission reductions modeled based on those actual savings in Arkansas's 2025 Regional Haze Progress Report.