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ARKANSAS ADVANCED ENERGY ASSOCIATION

THE CLEAN POWER PLAN AND ARKANSAS'S ELECTRIC SYSTEM

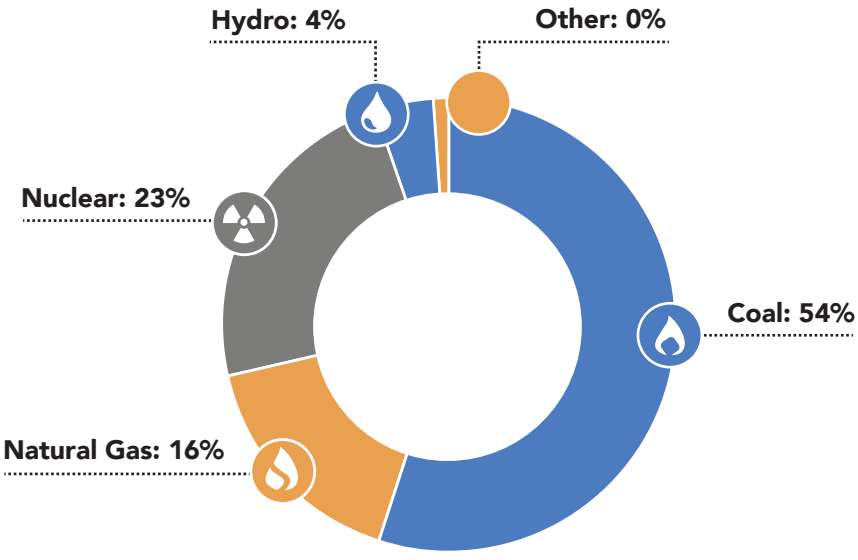
The U.S. Environmental Protection Agency (EPA) will soon release the final rule for carbon emissions from existing power plants, called the Clean Power Plan (CPP). The rule represents the next step in the process of carbon regulation that began with the Supreme Court's determination in 2007 that carbon dioxide (CO_2) qualifies as an air pollutant subject to regulation by EPA under the Clean Air Act.[1]

Under Section 111(d) of the Clean Air Act, EPA will set air pollutant standards for each state based on what EPA determines to be the "best system of emission reduction" (BSER). In its proposal, EPA determined the BSER based on state specific potentials for emission reductions from four "Building Blocks" that include both traditional smokestack controls as well as "beyond the fence line" measures, namely improving the efficiency of coal plants, increasing dispatch of existing natural gas plants, deploying renewable and nuclear power generation, and reducing demand by means of energy efficiency.[2]

Two different Regional Transmission Organizations (RTOs) are responsible for transmission services and maintaining reliable electricity in the state: the Midcontinent Independent System Operator (MISO) and the Southwest Power Pool (SPP). The Analysis Group has also released a report finding that the MISO region is well-positioned to comply without hurting reliability of the Midwestern grid. [3,4]

Although Arkansas's emission rate target is set by the Building Blocks, there is no requirement that the state use those specific measures for compliance. Rather, in developing a compliance plan to achieve the interim (2020-2029) and final (2030-2032) targets, the state is free to use other technologies and policy tools. This gives Arkansas an opportunity to design a plan that is best suited to the resources and needs of its unique power system.

Arkansas Electricity Generation Mix (2014)



Source: AEE PowerSuite

A Strong Foundation

Arkansas has a strong foundation for a compliance plan. Although the state's five coal-fired facilities currently account for 54% of the electricity it produces, Arkansas has a diverse generation mix that includes natural gas, nuclear, and hydroelectric power.[5] With the fifth-largest proven shale gas reserves among U.S. states, Arkansas also stands to benefit from other states boosting their natural gas usage under the CPP.[6] Arkansas has recently started to develop its renewable and demand side resources, with plenty of room to grow. At an average retail price of 7.62 cents/kWh in 2012, Arkansas enjoys the fourth lowest average retail electricity price among U.S. states.[7] The state also exports electricity to its neighbors, with 38,000 GWh of electricity sold out-of-state in 2012.[8]

However, Arkansas faces a number of challenges in its power system. Arkansas is one of the few states where emissions have increased in recent years, up 39% between 2005 and 2012.[9] Over 60% of the electricity generated in the state comes from power plants that were constructed more than 30 years ago.[10] Arkansas's aging infrastructure leaves the state vulnerable to reliability issues. Arkansas suffered 39 power outages in 2014, up from 33 the year before, with nearly 2,000 people affected per outage on average.[11] Outages are not only disruptive but also expensive, with an annual estimated cost to the U.S. economy of $150 billion.[12]

To maintain improvements in the reliability, affordability, and resilience of Arkansas's electricity system, the state must continue to invest in 21st century electricity generation and grid technologies. Luckily, these same technologies will also lower the state's carbon emissions. Thus, with a flexible design that allows states to select the technologies and services for compliance to suit the needs of the state, the Clean Power Plan presents Arkansas with an opportunity to modernize its electric grid for the benefit of consumers and the economy. In designing its compliance plan, Arkansas can reduce emissions, maintain affordability, and increase reliability.

Adjusted Starting Rate[13]	Interim Target (average 2020 – 2029)	Final Target (2030 – 2032)	Total Reduction Required (2032)
1,634 lbs CO_2/MWh	968 lbs CO_2/MWh	910 lbs CO_2/MWh	724 lbs CO_2/MWh (44%)

What the Clean Power Plan Means for Arkansas

In 2014, advanced energy directly provided 16,000 jobs and produced an estimated $1.7 billion in sales for the state's economy and indirectly provided 25,000 jobs and revenues of $2.8 billion.[18]

The interim and final emission rate targets for Arkansas may change in the final rule, but the options for compliance will largely stay the same. Many of the things that the state is already doing will help it meet the finalized target emission rates set by EPA. Arkansas has adopted a Sustainable Energy Resources Action Plan (SER) that includes an Energy Efficiency Resource Standard (EERS).[14] While the state lacks a similar standard for renewable energy, Arkansas power suppliers are already expanding their renewable resources in ways that will help the state achieve its required emission reductions. Arkansas rural electric cooperatives have now entered into power purchase agreements (PPAs) with Oklahoma wind energy producers for a total of 309 MW of wind energy.[15] AEP Southwestern Electric Power Company (SWEPCO) has signed an additional 469 MW of PPAs, some of which will be used to supply Arkansas customers.[16] Within the state, Entergy Arkansas (EAI) has announced plans to develop an 81 MW solar generating plant in East Arkansas.[17]

How Advanced Energy Can Help

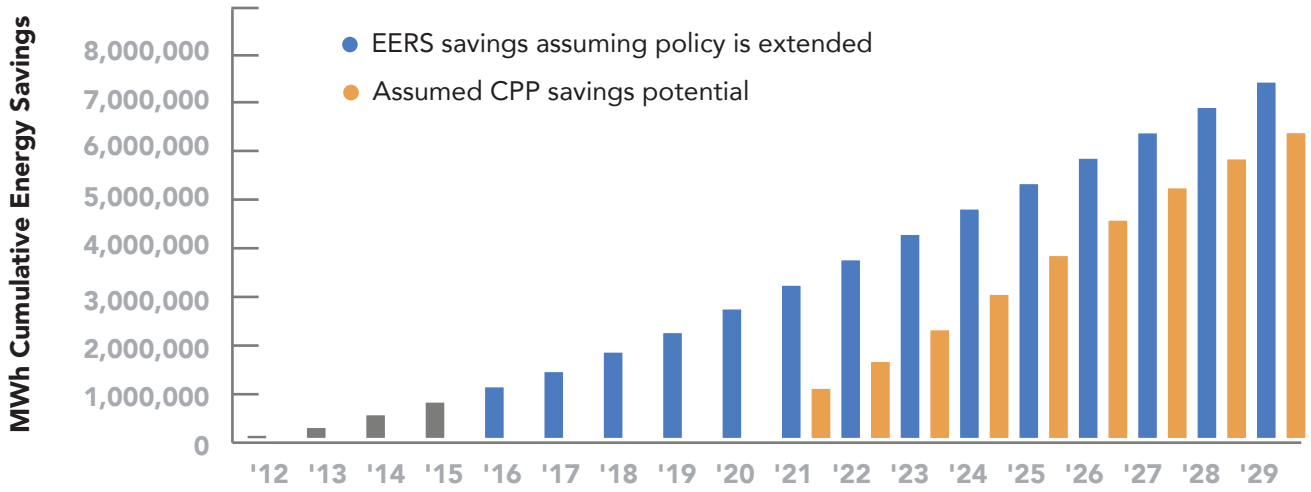
As Arkansas develops its compliance plan, it can consider a host of policies, technologies and services that reduce its carbon emissions as well as help it achieve other electric system and economic objectives. Many of these strategies are already being implemented in Arkansas, and could be scaled up to achieve more.

Renewable Energy		
Biomass	As of 2013, the state had 451 MW of renewable energy capacity, mostly fueled by biomass.[20] Arkansas has an estimated 19.8 thousand GWh of electric capacity stored in biomass fuels. If the state developed this resource, it could supply 150% of all residential demand through locally produced energy that also helps the state achieve compliance with EPA.[21]	**Renewable Energy Policies** **A number of policies could help Arkansas develop its renewable resources, achieving emission reductions while spurring economic growth.** **Arkansas's EERS can be used as a model for developing a similar standard for renewable generation.** **The state's net metering policy is favorable to customer-sited distributed generation, but the state lacks tax incentives that encourage deployment of renewable energy in some other states.** **In 2010, The Fayetteville Public Library installed a 48 panel, rooftop solar system that will generate the library's electricity and serve as a testing ground for Arkansas Power Electronics International's energy-efficient inverter technology.[19]**
Wind	Wind contributes little to the state's generation mix, yet Arkansas has a technical capacity of 9 GW, which could produce enough to power 1.5 million homes.[22] Nonetheless, thanks to the state's wind manufacturing tax credits, the wind-power industry employed over 300 people in the state in 2013, with one manufacturing facility in Central Arkansas producing wind blades.[23,24]	
Solar	With only 4MW of installed capacity, Arkansas ranks 40th among states in solar.[25] This is a fraction of the state's technical potential of over 2,700 GW of capacity, which could produce nearly 5 million GWh of electricity annually.[26] In April of this year, Entergy Arkansas announced a 20-year PPA for an 81 MW solar facility. This one facility will increase Arkansas's total renewable generation by nearly 10% and, on its own, would achieve 1% of the state's required emission cuts. The project could save customers $25 million over 20 years in fuel costs.[27]	

Some Grid Modernization Technologies	
Advanced Metering Infrastructure (AMI)	In 2010, the Woodruff Electric Cooperative installed nearly 15,000 two-way communicating smart meters to residential and commercial customers. These meters will improve reliability and reduce operating costs for the cooperative.[28] The data and control provided by AMI enables utilities and consumers to better manage energy use.
Distribution Automation	Distribution automation helps optimize voltage conservation and reactive power, integrate more distributed generation, and increase energy efficiency throughout the system without action on the part of customers, all of which helps to reduce emissions. This has the added benefit of improving the reliability of the grid.[29]
Energy Storage	Including the innovative methods for concentrated solar thermal storage being developed by the University of Arkansas, energy storage allows higher penetration of variable renewables, offsets emissions from older, dirtier plants for meeting peak demand, and relieves grid congestion when demand is high and transmission and distribution equipment losses are highest.[30]
Demand Response	Demand response brings down peak load, which can directly reduce emissions up to 1% nationally, moderates energy prices for everyone.[31,32]

Energy Efficiency		
Utility Energy Efficiency	In the first three years, the state's EERS brought considerable growth to Arkansas to the tune of $318 million of economic activity in the energy efficiency sector.[40] Yet Arkansas can do more to use energy efficiency to achieve cost-effective emission reductions and save consumers money. As the graph below shows, if Arkansas extends its current EERS without changing its growth rate, it will far exceed the savings deemed achievable by BSER.	**Energy Efficiency Policies** **Arkansas has quickly become a leader in energy efficiency for the Southeast.[33] The growth in energy efficiency is due primarily to Arkansas's EERS, which expires this year but is expected to be extended to 2018.[34]** **A recent report found that Arkansas can achieve nearly 40% of its required reduction from four policies alone, bringing total economic benefits of 5,000 jobs, $44.6 billion in increased gross state product, and $3.8 billion in energy savings by 2030.[35,36]** **Arkansas already has a statewide Building Energy Code that helps drive efficient choices in new buildings, and the state leads by example with more stringent standards for public buildings.[37,38]** **The state recently expanded energy performance contracting for public buildings in Arkansas.[39]**
Energy Service Companies (ESCOs) Services	Arkansas's EERS applies to only 53% of total electricity sales because it does not cover municipal and rural electric utilities and large commercial and industrial customers are allowed to opt out, suggesting that there are additional efficiency savings to be found among these users.[41] The non-utility sponsored efficiency savings from the ESCO market are nearly equal in size to utility programs nationally.[42] A recent report estimates that continued growth in the ESCO market in Illinois could help the state achieve as much as 11% of its total reduction under the draft CPP.[43]	
Behavioral Efficiency	Using AMI combined with behavioral efficiency services has been shown to reduce energy usage and drive down prices for everyone. Behavioral efficiency in Arkansas can achieve 1% of the state's total required emission reduction and save consumers a total of $307 million by 2030.[44]	

Arkansas's Existing Energy Efficiency Policy Exceeds CPP Requirements



Source: GHG Abatement Measures TSD and calculations from AEE PowerSuite data

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ENDNOTES

1. In the landmark 2007 case Massachusetts vs. EPA, the Supreme Court ruled that carbon dioxide is an air pollutant subject to regulation under the Clean Air Act, and EPA is therefore required to administer guidelines for emission reduction, http://www.supremecourt.gov/opinions/06pdf/05-1120.pdf. Since that ruling, the Supreme Court has upheld EPA's authority to regulate carbon emissions on two separate occasions, including American Electric Power Company vs. Connecticut and in Utility Air Regulatory Group vs. EPA, which upheld EPA's authority to regulate emissions from stationary sources, http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf and http://www.nytimes.com/2014/04/30/us/politics/supreme-court-backs-epa-coal-pollution-rules.html.
2. For a more in depth look at how the Building Blocks were established and applied to individual states in the Proposed Rule, see EPA TSD: GHG Abatement Measures. http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-ghg-abatement-measures.pdf
3. http://www.eenews.net/assets/2014/09/18/document_ew_01.pdf
4. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_clean_power_plan_miso_reliability.pdf
5. Arkansas's five coal facilities contribute 86% of its carbon emissions. http://www.adeq.state.ar.us/air/branch_planning/pdfs/june25_eddypsc_epa-goal_arkansas-facilities.pdf
6. http://www.eia.gov/naturalgas/crudeoilreserves/pdf/uscrudeoil.pdf
7. http://powersuite.aee.net/portal/states/AR/energy_data and http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a
8. http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_sum/html/sum_btu_1.html&sid=US
9. http://www.adeq.state.ar.us/air/branch_planning/pdfs/june25_eddypsc_epa-goal_arkansas-facilities.pdf; and http://www.eia.gov/electricity/state/Arkansas/
10. EPA TSD: 2012 Unit Level Data, http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents
11. For outage statistics in Arkansas, see Eaton Blackout Tracker (2014): http://images.electricalsector.eaton.com/Web/EatonElectrical/%7Baa0d93cf-362a-4bd9-9005-bb723dd40d97%7D_USBlackoutTracker2014ReportFinal.pdf
12. http://images.electricalsector.eaton.com/Web/EatonElectrical/%7Baa0d93cf-362a-4bd9-9005-bb723dd40d97%7D_USBlackoutTracker2014ReportFinal.pdf
13. Includes 5.8% of nuclear which EPA deems to be at-risk of retirement, and existing 2012 renewable generation.
14. http://powersuite.aee.net/portal/states/AR/energy_policies
15. http://www.aecc.com/renewable-resources/wind-energy
16. http://www.aecc.com/renewable-resources/wind-energy
17. http://www.law360.com/articles/643533/entergy-nextera-team-up-for-81-mw-ark-solar-plant
18. http://www.arkansasadvancedenergyfoundation.org/files/dmfile/AEJOBSReport.FINAL.pdf
19. http://www.fplsolar.org/?p=114
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21. http://arkansasenergy.org/solar-wind-bioenergy/bioenergy/biomass.aspx
22. http://www.nrel.gov/gis/re_potential.html
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30. http://news.uark.edu/articles/19653/researchers-develop-effective-thermal-energy-storage-system
31. Navigant Consulting, Carbon Dioxide Reductions from Demand Response (Nov. 25, 2014), prepared for the Advanced Energy Management Alliance (AEMA) and included in AEMA's comments to EPA on the Clean Power Plan. http://aem-alliance.org/study-finds-significant-greenhouse-gas-savings-demand-response-group-urges-epa-incorporate-clean-power-plan/
32. http://www.coned.com/energyefficiency/PDF/DemandResponseProgramsDetails.pdf
33. http://aceee.org/press/2014/10/massachusetts-tops-california-most-energy-efficient-state-while-arkansas-dc-kentucky
34. http://powersuite.aee.net/dockets/ar-13-002-u?docket_search_id=34476&filing_search_id=34478
35. The four policies considered by ACEEE were: CHP, building codes, appliance standards, and an energy efficiency savings targets http://www.arkansasadvancedenergyfoundation.org/files/dmfile/Elliott_AAEF_Presentation8-14-14.pdf
36. http://www.aceee.org/sites/default/files/publications/researchreports/e1401.pdf
37. http://www.arkansasenergy.org/residential/builders/energy-code.aspx
38. http://www.arkansasenergy.org/government.aspx
39. http://arkansasenergy.org/incentives-programs/arkansas-energy-performance-contracting

40. http://www.adeq.state.ar.us/air/planning/carbon/materials.aspx#aug28Meeting; http://www.adeq.state.ar.us/air/branch_planning/pdfs/carbon_pollution/aaef_stakeholder_meeting_presentation_8_28_2014_20140825.pdf
41. http://aceee.org/research-report/u1408
42. Up 10% from 2013, the U.S. ESCO market produced approximately $611.2 million in revenue in 2014, not including HVAC equipment ($4 billion nationally). The entire ESCO market is expected to continue growing at a rapid pace, reaching $10.6-$15.3 billion in total revenue by 2020. See Advanced Energy Now 2014 Market Report, http://info.aee.net/advanced-energy-now-2014-market-report
43. ACEEE State and Utility Pollution Reduction (SUPR) Calculator http://aceee.org/state-and-utility-pollution-reduction-supr
44. ACEEE State and Utility Pollution Reduction (SUPR) Calculator http://aceee.org/state-and-utility-pollution-reduction-supr