



DELIVERING POWER:

AN OVERVIEW OF MISSISSIPPI'S ELECTRIC TRANSMISSION SYSTEM

Introduction

In Advance Mississippi's first issue brief, *Keeping Mississippi Powered*, we discussed one of the two basic building blocks of powering our homes and business – generation. The following issue brief presents an overview of the second component – transmission.

The U.S. Department of Energy (DOE) estimates that demand for electricity will increase by 30 percent between 2006 and 2030.¹ That's the equivalent of adding four states the size of California with equivalent power demand to the nation's grid. Facing this type of growth, it is easy to understand why a strong transmission system in the U.S. and Mississippi is critical to ensuring that homes and businesses have the power that they need.

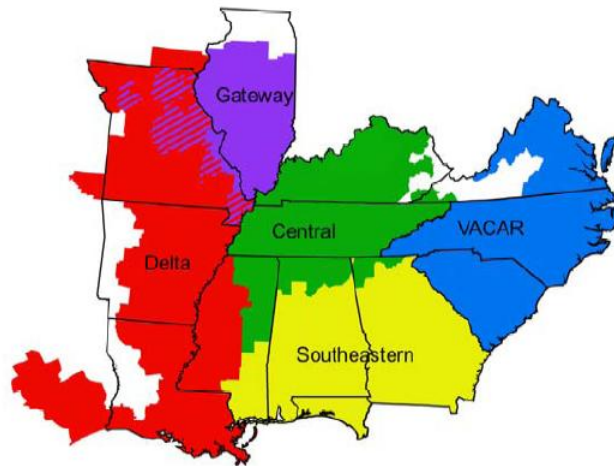
The existing U.S. electric grid is massive, and may well be the largest sophisticated machine in the world. If the machine goes down, quality of life as we know it ceases. Nationwide there are over 200,000 miles of high-voltage transmission lines which deliver electricity from power plants to the customer. While that may seem like more than enough, the North American Electric Reliability Corporation (NERC), a non-profit corporation set up by FERC to develop and enforce mandatory reliability standards for bulk power system operations, states that the U.S. will need more than 15,000 miles of additional transmission lines over the next decade.²

Regionally, the Southeastern Electric Reliability Corporation (SERC) oversees the reliability and infrastructure in most of Mississippi and several other southeastern states. In a report prepared for NERC, SERC states that an additional several hundred miles of transmission line will be needed in their region by 2017.³ As Mississippi's need for additional electricity continues to grow, it is important that utility companies can continue to deliver reliable power to their customers at an affordable price. The map on page two shows SERC's region and five sub-regions.

¹ "Annual Energy Outlook 2009 with Projections to 2030," U.S. Energy Information Administration:
<http://www.eia.doe.gov/oiaf/aeo/electricity.html>

² 2008 Long-Term Reliability Assessment, 2008-2017. North American Electric Reliability Corporation, p. 15.
<http://www.nerc.com/files/LTRA2008.pdf>

³ Ibid.



SERC's region and five sub-regions

Transmission Challenges in the United States

While Mississippi has mostly avoided the mass power outages that have made headlines in recent years, other parts of the U.S. have not been so lucky. Major service interruptions have occurred in New York and California, often because transmission systems have not kept pace with increasing customer demand and upgrades have not been made.

Notorious blackouts include:

- The Northeast blackout of August, 2003 resulted in power outages which left 40 million Americans in eight states and 10 million in Ontario, Canada without electricity. The blackout is estimated to have cost approximately \$1 billion.
- In 2006, a power outage in Queens, New York resulted in power outages that left over 100,000 customers without power and cost more than 750 businesses in damaged goods and lost revenue.
- During the 2006 heat wave, California experienced a series of rolling blackouts when temperatures reached 100 degrees over a period of many days. The system was overwhelmed as a result of so many homes and businesses running air conditioners.

As the above examples demonstrate, blackouts are costly for the local economy as factories and businesses are forced to shut down. Extended power interruptions are also a public safety hazard, particularly for those who rely on life-saving medical equipment or are susceptible to extreme temperatures.

Furthermore, the 2003 blackout resulted in the 2005 Energy Policy Act that gave FERC the authority to establish an Electric Reliability Organization (ERO) to enforce mandatory reliability standards. NERC applied for and was approved as the ERO and SERC was subsequently approved as the regional reliability organization.

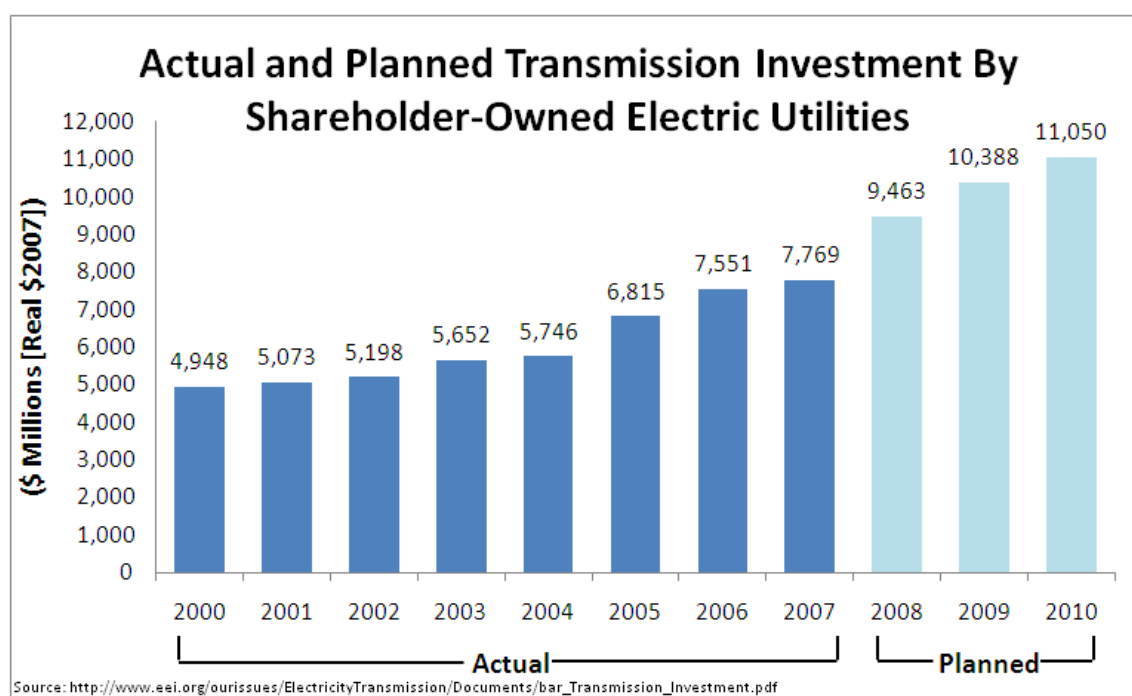
Some have advocated for a nationwide overhaul of the way electricity is delivered to customers, saying that the current grid is antiquated 20th century technology not equipped to meet the

needs of 21st century society. Proponents of “smart grid” technologies, which are designed to increase two-way communication between electricity users and producers, say that this new technology will increase reliability, allow utility companies to quickly locate power disruptions, and more easily allow for the incorporation of renewable energy sources into the national grid.

Although many in the utility industry disagree in labeling the current grid as being “antiquated,” they do agree that there is a need to expand the nation’s transmission grid to relieve congestion, accommodate more baseload power and incorporate renewable resources into the grid.

Because the DOE estimates that it would take tens of billions of dollars to upgrade the transmission system (and it has yet to be determined who is responsible for paying for this massive project), some have cautioned for a more tempered approach to launching significant transmission changes.

The chart below from the Edison Electric Institute demonstrates the magnitude of actual and planned transmission investment by shareholder-owned utilities from 2000 through 2010.



Mississippi’s Transmission System

Similar to blood flowing through the human circulatory system, electricity flows throughout the entire transmission system, and changes in one area affect the entire system. Because of this, utility companies continually invest in transmission throughout their system, which benefits not just the location where the transmission project or upgrade is located, but all of the customers in their electric transmission system.

In Mississippi, there are three predominant electricity providers that also manage the transmission infrastructure in their respective service areas. Entergy Mississippi, Inc., Tennessee Valley Authority (TVA), and Mississippi Power Company all work with sister companies or internally to send electricity across state lines as part of managing a reliable transmission grid and meeting the growing demand for electricity. To ensure that the transmission infrastructure continues to be reliable, regular investments are made on a consistent basis. Costs for these investments cannot be understated, and depending on the voltage, each mile of a power line costs millions of dollars. The chart on page four shows transmission unit costs in 2008 dollars.

Recent Unit Transmission Costs 2008 Dollars			
Voltage (kV)	Cost (Thousands of Dollars/Mile)	Capacity (MW)	Cost (Millions of Dollars/GW-Mile)
230	\$2,076.50 (\$2,076,500/mile)	500	\$5.46
345	\$2,539.40	967	\$2.85
500	\$4,328.20	2,040	\$1.45
765	\$6,577.60	5,000	\$1.32

Source: EEI's "Transmission Projects at a Glance," January 2008.

Entergy Mississippi, Inc. provides power in the 45 counties in the western part of the state and is a subsidiary of Entergy, Inc., which also provides electricity in Louisiana, Texas and Arkansas. Entergy, Inc. maintains more than 15,000 miles of high-voltage transmission lines and since 2003 Entergy, Inc. has invested over \$2 billion in expanding and upgrading its transmission systems in the four southern states where it provides electricity.

The Tennessee Valley Authority (TVA) provides electricity in the 36 northeastern Mississippi counties in addition all of Tennessee and portions of Kentucky, Virginia, Georgia and Alabama. TVA operates one of the largest transmission systems in the country covering approximately 80,000 square miles that sends electricity produced by TVA-owned and independently owned generating facilities that reach nine million customers.

Mississippi Power provides electricity to nearly 189,000 customers in 23 southeastern Mississippi counties and the company manages over 2,000 miles of transmission lines. It is a subsidiary of Southern Company, which also provides electricity in Georgia, Florida and Alabama. The company oversees more than 27,000 miles of transmission lines in the four states and spent approximately \$1.6 billion on its system from 2006-2008.

Conclusion

As demand for power in the U.S. and Mississippi will continue to increase over the next several decades, having a reliable and efficient transmission system is key to ensuring that homes and businesses are able to get the power that they need. Electric utility companies like Advance Mississippi members Entergy Mississippi and TVA will continue to make investments to



enhance the existing grid and ensure a high quality transmission system. As new technologies are developed and renewable energy sources integrated, it is important that changes to the transmission grid take these challenges into account while providing Mississippians with dependable and affordable electricity.

Additional Resources

North American Electric Reliability Corporation

<http://www.nerc.com/files/LTRA2008.pdf>

SERC Reliability Corporation

<http://www.serc1.org/Application/HomePageView.aspx>

Southwest Power Pool – 2008 Annual Report

<http://www.spp.org/publications/SPP%202008%20Annual%20Report.pdf>

Southwest Power Pool – “The Benefits of a ‘Transmission Superhighway’”

http://www.spp.org/publications/Benefits_of_Robust_Transmission_Grid.pdf

Entergy, Inc. transmission website

<http://www.entergy.com/transmission/default.aspx>

Southern Company transmission website

<http://www.southerncompany.com/transmission/home.aspx>

Tennessee Valley Authority transmission website

<http://www.tva.com/power/xmission.htm>

Advance Mississippi’s mission is to advocate for sensible energy policy that will fuel economic opportunity in Mississippi, and educate policy makers, business and community leaders, and the general public about superior energy policies that will foster economic growth. For more information visit www.advancemississippi.com.

The Smart Grid and New York State

Authored by:
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Electricity demand continues to rise sharply in the United States, and is predicted to grow an additional 30 percent by 2030.¹ Utility companies and consumers are caught between 20th Century infrastructure and inefficiency and 21st Century consumer technology. In a society that is ever more dependent on reliable and consistent sources of electricity, the U.S. must look for new ways to upgrade its energy infrastructure.

In certain areas of the country demand has outstripped supply, resulting in brownouts and blackouts over the last decade. While temporarily losing power might seem a mere inconvenience, it can do great damage to the business sector in addition to endangering the lives of citizens. According to the U.S. Department of Energy, reliability challenges “are estimated to cost American business more than \$100 billion on average each year.”² The infamous northeast blackout of 2003 alone left over 14 million people in the New York City and surrounding areas without power and is estimated to have resulted in \$1 billion in damages.

Some energy experts believe that smart grid technology, with its ability to sense problems before they occur and increase communications between energy providers and consumers, is the answer.

What Is The Smart Grid?

Smart grid uses digital technology to deliver electricity to consumers to save energy, reduce costs and increase reliability. It also enables two-way flow of electricity and information and is capable of monitoring everything from power plants to consumer preferences. For example, during periods of peak demand, information can be sent to power plants notifying them of exactly how much power is needed. Under the current system, power plant operators sometimes overestimate the demand for power on a given day which leads to wasted energy and unnecessary pollution.

In 2008, in an effort to solidify the goals and definitions of smart grid technology, the U.S. Department of Energy created a Smart Grid Task Force which developed the seven characteristics of a smart grid:³

- Enable active participation by consumers
- Accommodate all generation and storage options
- Enable new products, services and markets
- Provide power quality for the range of needs in a digital economy
- Optimize asset utilization and operating efficiency
- Anticipate and respond to system disturbances in a self-healing manner
- Operate resiliently against physical and cyber attacks and natural disasters

Smart grid technology has also received national attention as part of the American Recovery and Reinvestment Act of 2009, better known as the stimulus package, which allocated \$11 billion in spending for

¹ Edison Electric Institute. http://www.eei.org/ourissues/ElectricityGeneration/Documents/bar_dmdelcinc.pdf

² “The Smart Grid: An Introduction,” U.S. Department of Energy, [http://www.ee.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages\(1\).pdf](http://www.ee.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages(1).pdf)

³ “Metrics for Measuring Progress Toward Implementation of a Smart Grid, U.S. Department of Energy, http://www.ee.energy.gov/DocumentsandMedia/Smart_Grid_Workshop_Report_Final_Draft_08_12_08.pdf



smart grid initiatives. Secretary of Energy Steven Chu said of the Act, "The modernization of the nation's electricity system has to be an integral part of this."⁴

However, the Act does not specify how that money should be spent nor does it address any barriers that might prevent a smart grid from being implemented. Hearings on the smart grid are planned for the spring of 2009 under Senate Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM), with the goal of introducing legislation to clarify the details of the Act.⁵

The Smart Grid and New York

New York State has already taken the first steps towards adopting smart grid technology. In February 2009, The New York Public Service Commission (NYPSC), which monitors and regulates New York State utility companies, established minimum functioning requirements for Advanced Metering Infrastructure (AMI),⁶ a key component of the smart grid. AMI is a two-way metering system that provides customers with pricing information to inform them of their energy consumption decisions while sending customer consumption information to a central data collection site. Additionally, because usage data is being sent from the customer to the utility company in real time, utility companies can get an exact reading on how much electricity is being consumed.

The NYPSC estimates that half the cost of installing the AMI will be made up in savings made in the reduction of traditional services, such as dispatching employees to read meters, as well as faster outage detection.

Governor David Paterson (D) has been supportive of measures to update the state's antiquated grid system and has made energy efficiency a cornerstone of his policy agenda. In his 2009 State of the State address, Gov. Paterson announced his "45 in 15" program whereby 45 percent of the state's electricity will come from improved energy efficiency and clean renewable energy by 2015. Implementation of a smart grid could help New York achieve this goal and, theoretically, consumers would be given greater ability to choose to receive their electricity from renewable resources using this technology.

Unresolved Issues

There are several hurdles that must be overcome before a smart grid can be implemented on a large scale, however.

Chief among these issues is the cost of smart grid technologies, which energy experts speculate will far outweigh the benefits of moving to a national, one-size-fits-all smart grid. Edward Krapels, the CEO of Anbaric Transmission, a company that works on grid issues, says it makes more sense to keep electricity that's generated in a given region, rather than sending it hundreds of miles away. He states that the East and West coasts can harvest wind power and solar energy can be used in the Southwest. Krapels says it makes sense to only have a "super grid" in the middle of the country.⁷

⁴ "The Secretaries, the Stimulus and the Smart Grid," *New York Times*, February 18, 2009,

<http://greeninc.blogs.nytimes.com/2009/02/18/the-secretaries-the-stimulus-and-the-smart-grid/>

⁵ "Senate Panel to Discuss Details of Setting Up Electric 'Smart Grid,'" *New York Times*, March 2, 2009,

<http://www.nytimes.com/gwire/2009/03/02/02greenwire-senate-panel-to-examine-details-benefits-of-sma-9921.html>

⁶ "PSC Moves Ahead with Advanced Metering Requirements," New York Public Service Commission, February 12, 2009.

[http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/0/73F14A5AD8956ECE8525755B005CAFBF/\\$File/pr09008.pdf?OpenElement](http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/0/73F14A5AD8956ECE8525755B005CAFBF/$File/pr09008.pdf?OpenElement)

⁷ "Electricity grid gets boost from Congress," *The Washington Times*, March 16, 2009,

<http://www.washingtontimes.com/news/2009/mar/16/electricity-grid-gets-boost-from-congress>

Also, while the stimulus package provides some funding for smart grid development, it is far from being enough to transform the nation's entire grid. It remains undecided who will be responsible for paying for the smart grid: the federal government, the states, or utility companies. While ultimately taxpayers and ratepayers will provide the funding, this disagreement is another potential source of delaying updating the nation's grid.

There is disagreement over whether the state or federal governments should have ultimate authority over the grid and this issue must be resolved for a smart grid to be implemented on a nation-wide scale. Although Congress gave the final authority to the Federal Energy Regulatory Commission (FERC) under the Energy Policy Act of 2005, the 4th Circuit Court of Appeals Ruled in February 2009 that FERC cannot overrule a state's decision to reject a transmission project.⁸ The case involved two utility companies who were seeking to construct high-voltage power lines in Maryland and Virginia which would deliver electricity to New York City.

U.S. Rep. James Sensenbrenner (R-WI) points out that much of the nation's renewable energy comes from the nation's interior while its population centers are along the coasts, and says that the regulatory process must be streamlined for siting new transmission lines.⁹

Because renewable energy is intermittent, new technology is required to regulate how and when these resources are used, says Tom Casey, CEO of Current Group, a company that designs and sells smart grid technology. On February 25, 2009, Mr. Casey told the House Select Committee on Energy Independence and Global Warming that "more intelligence" must be in the grid for renewable energy to reach its full potential.

Conclusion

The smart grid incorporates a variety of technologies that have the potential to make energy production, transmission and consumption more efficient. However, because the technology is new, it remains to be seen how a smart grid system would be implemented and operated over a vast statewide or nationwide network, even though several countries in Europe, including Italy and Denmark, have already starting transitioning to smart grid technology. In the United States, Austin, TX and Boulder, CO are at the forefront of incorporating smart grid technologies.

Unresolved regulatory issues and the costs of a smart grid have the potential to delay or prevent the U.S. from moving to a nationwide system. If these delays continue, there is the possibility that the country will operate on a patchwork of regional grids using either 20th or 21st century technology as some municipal and state governments choose to move forward with smart grid technology.

⁸ "Electricity grid gets boost from Congress," *The Washington Times*, March 16, 2009, <http://www.washingtontimes.com/news/2009/mar/16/electricity-grid-gets-boost-from-congress>

⁹ Ibid.

About the Author: Dr. Matthew Cordaro is a seasoned electricity industry executive who formerly served as President and CEO of the Midwest Independent System Operator, the not-for-profit operator of the region's transmission grid; and CEO of Nashville Electric, one of the 10 largest public utilities in the U.S. He currently serves as a professor at Long Island University where he specializes in energy research and policy development.

About New York AREA: Founded in November 2003, the New York Affordable Reliable Electricity Alliance (New York AREA) is a diverse group of more than 125 business, labor, and community groups whose mission and purpose is to ensure that New York has an ample and reliable electricity supply, and economic prosperity for years to come. New York AREA helps to educate policy makers, businesses, and the general public regarding the necessity and importance of safe, low-cost and reliable electricity. For additional information visit: www.area-alliance.org.

Additional Information

U.S. Department of Energy – *“The Smart Grid – An Introduction”*
<http://www.oe.energy.gov/1165.htm>

Energybiz Magazine – January/February 2009 – *“Changing How the World Works – The Elements of a Smart Grid.”*
http://energycentral.fileburst.com/EnergyBizOnline/2009-1-jan-feb/Tech_Front_World_Works.pdf



Backgrounder: The White Bluff Environmental Controls Project

Entergy Arkansas, Inc. plans to install environmental controls on its White Bluff coal plant to reduce sulfur dioxide (SO₂) emissions by more than 95 percent and nitrogen oxide (NO_x) emissions by more than 50 percent. The White Bluff plant is an important source of power for Entergy Arkansas' customers, providing a reliable and low-cost supply of electricity.

Installing dry SO₂ scrubbers and low NO_x equipment complies with Arkansas' implementation plan of the U.S. Environmental Protection Agency's Clean Air Visibility Rule. These environmental controls are required for the plant to operate beyond September, 2013.

After conducting a thorough environmental and economic analysis and evaluating the alternatives (including a plant purchase, new plant construction and purchased power), Entergy Arkansas concluded that installing the new scrubber equipment at White Bluff would best serve our customers as the most cost-effective alternative.

White Bluff Facts

White Bluff Units 1 and 2:

1,657 megawatts (Unit 1 – 815 MWs, Unit 2 – 840 MWs).

Plant Ownership:

Entergy Arkansas, Inc. – 57%
AR Electric Cooperative – 35%
City of Jonesboro – 5%
City of Conway – 2%
City of West Memphis – 1%

Location:

Redfield, Ark.

Employees:

Approximately 145.

Fuel:

Coal, primarily from the Powder River Basin in Wyoming.

Date of Commercial Operation:

Unit 1 – 1980; Unit 2 – 1981

Scrubber Project Overview

Cost: Entergy Arkansas, Inc.'s portion of the estimated \$1.04 billion total is \$631 million.

Timeline: Construction is expected to start late 2010 with start-up of the second unit scrubber in spring 2013.

Technology: A spray dryer flue gas desulphurization system, or scrubber, will be installed to remove SO₂ and the furnace will be modified as low NO_x burners with separated overfire air.

How it Works: The dry scrubber system works by mixing gases exiting the furnace with a slurry of lime in large vessels. In these vessels (two or three per unit), the SO₂ and lime mix to form a powder, which is captured by a second system called a baghouse. This powder byproduct is then collected and disposed in an on-site landfill.

SO₂ and NO_x Reduction: Spray dryer technology will remove greater than 95 percent of SO₂ from the furnace gases before they enter the atmosphere. Low NO_x burner equipment will reduce NO_x emissions by more than 50 percent. Particulate matter and other air pollutants will also be reduced.

Economic Benefits: At peak construction activity, there will be 1,100 new jobs and an estimated 25 permanent new jobs at White Bluff. There will be additional economic impact through businesses and suppliers providing material, equipment and services in support of construction and operation of new facilities.

How prevalent is the scrubber technology?

Seventy percent of U.S. coal plants have installed scrubbers or have announced plans to install scrubbers: 196 operating coal units in the U.S. have been retrofitted with scrubbers, 211 units have scrubbers planned or under construction, and 134 units had scrubbers installed to meet environmental regulations when they were built.

What is Entergy doing about other emissions not mitigated by scrubbers, such as CO₂?

Entergy was the first U.S. electric generating company to establish a voluntary commitment to stabilize carbon dioxide emissions from its power plants at 2000 levels from 2001 through 2005. In 2006, Entergy made a second commitment to stabilize CO₂ emissions from its power plants at 20 percent below 2000 levels through 2010. Entergy's cumulative CO₂ emissions for the years 2006, 2007 and 2008 were 122.9 million tons, 4 percent better than our stabilization goal of 127.7 million. Since Entergy made its first stabilization commitment in 2001, the company has emitted 327.4 million tons of CO₂, which is 20 percent below our cumulative stabilization goal for the eight-year period.

As a Matter of Fact:

White Bluff is a relatively low emitting unit for SO₂ because it has federal permits limiting its sulfur emissions and requiring it burn low sulfur coal. In fact, over the last 20 years, other utilities have had to make investments to install scrubbers to bring their emissions more in line with standards Entergy has already met.

Where would Entergy Arkansas' \$631 million share of the project come from?

The costs of the capital expended on the project (like financing costs you would have on a construction loan on a new house) will be recovered over time from Entergy Arkansas' customers through rates approved by the Arkansas Public Service Commission.



Artist rendering of installed scrubbers at White Bluff.



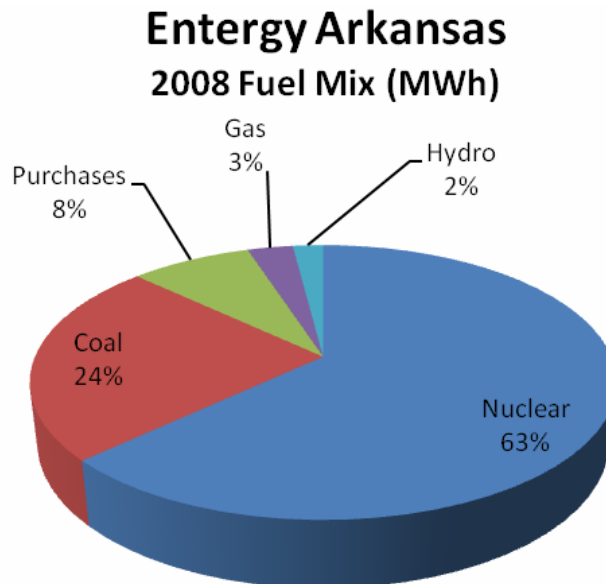
FACT SHEET

-An Overview of Entergy Arkansas' Portfolio

Entergy Arkansas, Inc. has a unique and extremely efficient energy portfolio, 87 percent of which is comprised of nuclear and coal – both “base load” energy sources which generate efficient, low-cost, and reliable electricity which benefits our customers in many ways.

First, nuclear is virtually emissions-free and is immune from the price fluctuations that occur with natural gas. That means that while nuclear is helping save our environment, it is also helping save you money. Also, coal is not only an abundant fuel source, but it is also one of the least expensive. Both nuclear and coal energy sources use domestic fuel sources, which helps reduce our country's dependence on foreign sources of energy.

As demand for energy increases here in Arkansas, Entergy Arkansas continues to look to new sources of generation that will continue to meet the needs of our customers.



Nuclear

- Arkansas Nuclear 1 and 2 – 54 percent
- Grand Gulf – 9 percent

Coal

- White Bluff 1 and 2 – 18 percent
- Independence Unit 1 – 6 percent

Natural Gas

- Ouachita Plant – 3 percent

Power Purchases

- Various – 8 percent