



Clean Energy in the Southern Region

Presented to:

Southern States Energy Board's Associate Members
August 27, 2010

Presented by:

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Secretary & Executive Director

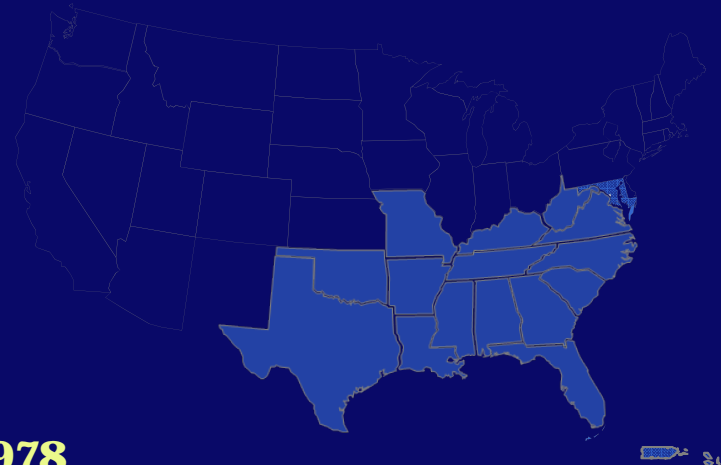


SSEB Background



Through innovations in energy and environmental policies, programs and technologies, the Southern States Energy Board enhances economic development and the quality of life in the South.

- SSEB Mission Statement



- **Established 1960, expanded in 1978**
- **16 U.S. States and Two Territories**
- **Each jurisdiction represented by the governor, a legislator from the House and Senate and a governor's alternate**
- **Federal Representative Appointed by U.S. President**





SSEB Activities Related to Reliable Power Supply



- **Southeast Regional Carbon Sequestration Partnership**
- **SECARB-Ed**
- **State Energy/Environmental Legislation**
- **International Cooperation – IEA, WEC, CSLF, GCCSI**
- **Water for Energy**
- **Southern States Biobased Alliance/National Biomass Partnership**
- **CASL- Nuclear Hub**
- **Nuclear Energy/Radioactive Materials Transportation Committees**
- **Clean Coal Technology and Advanced Power Systems**
- **CO₂ Pipeline and Outer Continental Shelf Studies**
- **Advanced Coal Technology Education and Outreach**
- **State Energy Planning**
- **Electric Utility Transmission Planning issues – CSG Committee**
- **Puerto Rico Green Energy Manufacturing**
- **50th Anniversary Annual Meeting**



National Need for Clean Energy Initiatives



- “[W]e need more production, more efficiency, more incentives, and that means building a new generation of safe, clean nuclear power plants in this country...It means continued investment in advanced biofuels and clean-coal technologies.”
 - ❖ President Obama in his State of the Union Address
- EPA finalized a rule implementing the long-term renewable fuels mandate of 36 billion gallons by 2022 established by Congress.
- USDA proposed a rule for Biomass Crop Assistance Program (BCAP) to convert biomass to bioenergy and bio-based products.
- Interagency Task Force on Carbon Capture and Storage released a comprehensive and coordinated federal strategy to speed the development and deployment of clean coal technologies (August 2010).



Southern Sources of Clean Energy



- **Nuclear**
 - ❖ 13 Southern states have commercial nuclear industries
- **Clean Coal**
 - ❖ Construction of coal-fired plants that are CCS ready
- **Natural Gas**
 - ❖ Increased shale plays and base load generating options
- **Renewables**
 - ❖ Biomass: several state R&D and production
 - ❖ Solar: construction of solar plants underway (FL, NC)
 - ❖ Wind: TX is a nation-wide leader in wind production



Nuclear Energy



Alabama: 25%

Florida: 16%

Kentucky: **

Maryland: 29%

Missouri: 11%

South Carolina: 53%

Tennessee: 27%

Texas: 12%

Virginia: 39%

Arkansas: 32%

Georgia: 23%

Louisiana: 26%

Mississippi: 24%

North Carolina: 34%

- % of electricity consumed by state
- **Paducah Gaseous Diffusion Plant





Nuclear Energy in the South



- **Current Capacity: 44 GW in 13 states**
- **Generation Around 353 Billion Kwh (43% of US)**
- **Potential Nuclear Capacity Additions: 27 GW**





SSEB Nuclear Programs



- **Consortium for Advanced Simulation of Light Water Reactors**
 - ❖ Program supports development of the next generation of nuclear reactors. SSEB is the education and outreach lead.
- **Transuranic Waste Transportation**
 - ❖ Task Force outlines policies and procedures for the interstate transport of transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico. Since its opening in 1999, the WIPP facility has processed over 8,600 shipments. SSEB issues annual subgrants in excess of \$1 million to states impacted by the shipment routes.
 - ❖ WIPPTREX exercise in Lindale, TX, demonstrated emergency response agencies' preparedness to handle an accident involving a WIPP shipment.
- **Radioactive Materials Transportation**
 - ❖ Committee focuses on the safe transport of radioactive waste through the region and emergency response training and stands ready to assist President Obama's Blue Ribbon Commission on America's Nuclear Future.





SSEB Nuclear Programs



➤ **Foreign Research Reactor Spent Nuclear Fuel Program**

- ❖ In 1994, SSEB provided assistance to DOE in planning for the transport of urgent-relief shipments of two urgent-relief shipments of spent fuel from foreign countries.
- ❖ Currently, SSEB's Cross-Country Transportation Working Group provides state participation in the DOE planning effort for a 23-year shipping campaign for up to 19.2 metric tons of spent nuclear fuel from research reactors all over the world.
- ❖ Over 14 years, 42 shipments have arrived in the U.S. through our region.

➤ **Southern Emergency Response Council (SERC)**

- ❖ Since 1972, SERC is a formalized emergency response agreement among 14 signatory states in the southern region to respond in case of a radiological incident.
- ❖ SSEB publishes the Southern Mutual Radiation Assistance Plan annually to outline the mutual aid agreement, implementation process, emergency response contacts and available state resources.





Nuclear Projects in the Southern Region



- **Alabama**
 - ❖ February 2009: TVA construction permit reinstated for two unfinished units – 1212MW (Bellefonte Nuclear Generating Station)
- **Georgia**
 - ❖ March 17, 2009: PSC approved two new reactors – 2,234 MW (Plant Vogtle)
- **Mississippi**
 - ❖ April 2007: Entergy received Early Site Permit for second reactor (Grand Gulf Nuclear Station)
- **South Carolina**
 - ❖ By 2020: 4,400 MW additional capacity (Duke Energy, SCANA, and Santee Cooper)
 - ❖ March 27, 2008: SCE&G applied for 1,100 MW (V.C. Summer Nuclear Generating Station)



Nuclear Projects in the Southern Region



➤ **Tennessee**

- ❖ August 2007: TVA Board decided to complete construction of Unit 2 – 1,180 MW by 2013 (Watts Bar Unit 2)

➤ **Texas**

- ❖ By 2015: NRG expects 2 new reactors to be operational – 1,350 MW (South Texas Project)
- ❖ 2 New Reactors (Comanche Peak)
- ❖ 2 Reactors (Exelon)
- ❖ 2 Unistar U.S. evolutionary power reactors (Amarillo Power)

➤ **Virginia**

- ❖ Dominion Virginia Power received site permit for new reactor – commercial operations by 2017 – 1,500 MW (North Anna Unit 3)



Coal



Alabama: 59%	Arkansas: 50%
Florida: 33%	Georgia: 63%
Kentucky: 92%	Louisiana: 39%
Maryland: 59%	Mississippi: 42%
Missouri: 85%	N. Carolina: 60%
Oklahoma: 54%	Puerto Rico: 14%
S. Carolina: 39%	Tennessee: 64%
Texas: 43%	Virgin Islands: <1%
Virginia: 48%	W. Virginia: 98%

% of electricity consumed by state



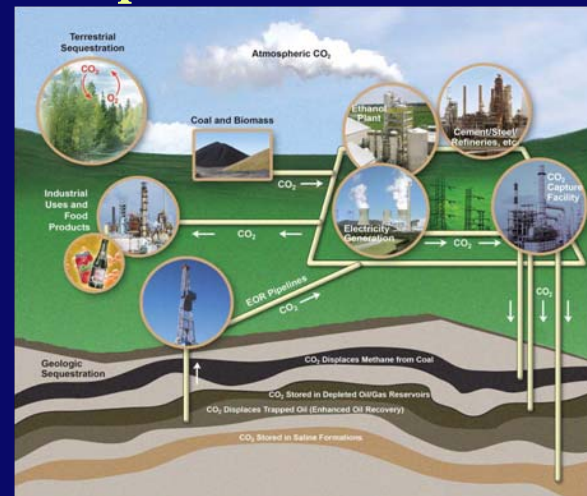
Carbon Dioxide Capture and Sequestration

➤ Key Issues to be addressed by comprehensive regulatory framework;

- ❖ Subsurface Ownership
- ❖ Long Term Liability
- ❖ Transfer of Ownership
- ❖ Project Authority
- ❖ Financing Source

➤ Southern states with CCS related Legislation

- ❖ Kentucky, Louisiana, Mississippi, Oklahoma, Texas, West Virginia





SECARB Phase II





SECARB Phase II



Two Coal Seam Projects

- Phase II Central Appalachian Coal Seam Project: Enhanced coalbed methane recovery (1,000 tons, completed in February 2009)
- Phase II Black Warrior Basin Coal Seam Project: Enhanced coalbed methane recovery (240 tons, currently underway)

Two Deep Saline Projects

- Phase II “Mississippi Test Site”: Small volume saline injection at large coal-fired power plant (Plant Daniel) (3,000 tonnes, completed in October 2008)
- Phase II Gulf Coast Stacked Storage Project: CO₂ MVA in an Enhanced Oil Recovery setting at Cranfield Unit (1.5 million tonnes, currently underway)



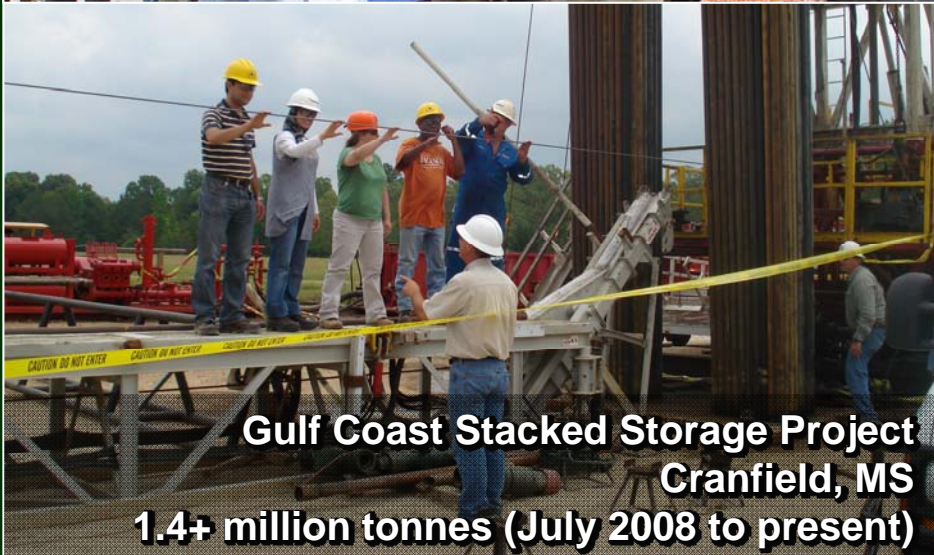
SECARB Phase II



**Coal Seam Project
Central Appalachia
Russell County, VA
1,000 tons (January-February 2009)**



**Coal Seam Project
Black Warrior Basin, Tuscaloosa, AL
240 tons (June-July 2010)**



**Gulf Coast Stacked Storage Project
Cranfield, MS
1.4+ million tonnes (July 2008 to present)**



**Mississippi Test Site
Escatawpa, MS
3,000 tonnes (October 2008)**



SECARB Phase III



SECARB Early Test was recognized by DOE for furthering CCS technology and meeting G-8 goals for deployment of 20 similar projects by 2010. The Early Test is the fifth project worldwide to reach the CO₂ injection volume of one million tonnes and the first in the U.S.

- (DOE Techline, 11/05/2009)



EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Anthropogenic Test

Capture: Alabama Power Plant Barry, Bucks, Alabama

Transportation: Denbury Resources'

Geo Storage: Citronelle Field, Citronelle, Alabama



Early Test

Denbury Resources' Cranfield Field
Near Natchez, Mississippi





SECARB Phase III



Two Deep Saline Projects

- Phase III Early Test: Large volume saline injection “down-dip” of EOR activity at Cranfield Unit (currently underway)
- Phase III Anthropogenic Test: Integrated CO₂ capture, transportation, and storage project at Plant Barry and Citronelle Field (to begin in FY2011)



SECARB Phase III

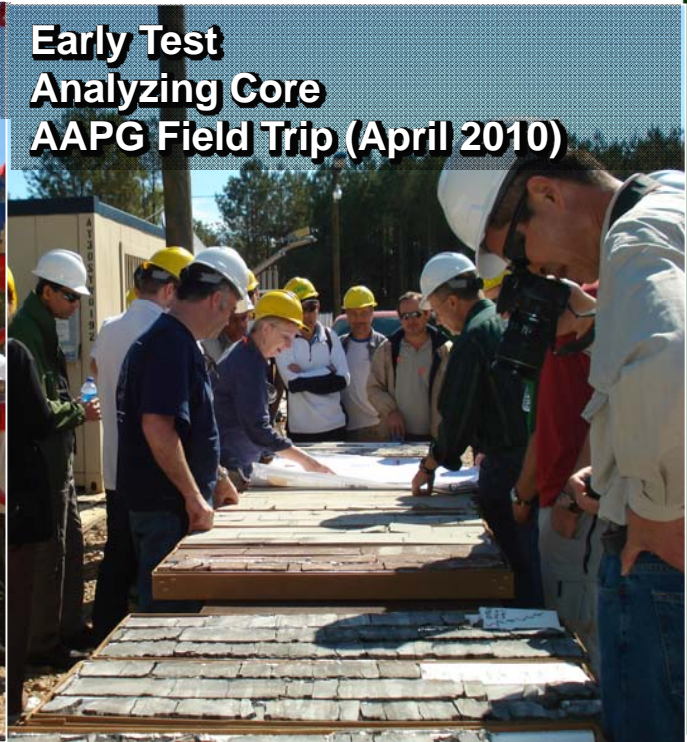
**Early Test
Monitoring Well**



**Early Test
Injection Well**



**Early Test
Analyzing Core
AAPG Field Trip (April 2010)**



**Anthropogenic Test
Capture Unit Fabrication**



**Anthropogenic Test
Groundbreaking Ceremony for
Capture Unit**



**Anthropogenic Test
Future Site of Monitoring
Well**





RCSP “Firsts” Achieved by SECARB



SECARB Phase II:

- The Gulf Coast Stacked Storage Project was the first of the RCSPs to monitor a 500,000 tonne CO₂ injection. As of July 31, 2010, 1.5 million tonnes have been monitored at the site.

SECARB Phase III:

- The Early Test is the first of the RCSPs to commence CO₂ injection.
- The Early Test is the first of the RCSPs to monitor a 1 million tonne CO₂ injection. The volume injected as of July 31, 2010, is 2,530,074 tonnes.
- The Anthropogenic Test is the first of the RCSPs to utilize anthropogenic CO₂.





SECARB Pipeline and Offshore Studies



- **Pipeline Study:** Identify barriers/opportunities for wide-scale construction of pipelines to transport carbon dioxide for geologic storage, enhanced oil recovery, and other commercial uses.
 - ❖ Pipeline Regulatory Work Group (Task Force)
 - ❖ Legal and Regulatory Research and Analysis
 - ❖ Summary Report to Include Research Findings and Recommendations
 - ❖ Technology Transfer Strategy
- **Preliminary Evaluation of Offshore Transport and Storage of CO₂:** Determine if offshore settings and any existing infrastructure are suitable for a sequestration project.
 - ❖ CO₂ Capacity Assessment for Delineated Federal and State Waters (2 documents by September 30, 2010)
 - ❖ Inventory of Existing Wells and Pipelines - Federal and State Waters (2 documents by September 30, 2010)
 - ❖ Guidance Document for Offshore Sequestration of CO₂ – Legal & Regulatory (1 document by March 31, 2011)
 - ❖ Various Briefing materials (throughout life of the project)





SECARB-Ed



➤ Purpose

- ❖ Develop a self-sustaining regional CO₂ sequestration training program to facilitate the transfer of knowledge and technologies required for site development, operations and monitoring of commercial CCS projects.

➤ Objectives

- ❖ Implement sponsorship development program
- ❖ Develop short courses on CCS technologies
- ❖ Conduct regional training and other activities through outreach and networking
- ❖ Perform region/basin technology transfer services





CCS Projects in the Southern Region



➤ **Alabama**

- ❖ U.S. DOE National Carbon Capture Center, managed by Southern Company Services (Wilsonville, AL).
- ❖ CO₂-EOR and Sequestration Project by UAB, Denbury Onshore, Geological Survey of AL, UofA, UNCC, and Southern Company (Citronelle, AL).
- ❖ Warrior Basin ECBM/Sequestration Coal Seam Pilot by UofA; GSA; EPRI, University of British Columbia, ORNL, Denbury Onshore, and Southern Company (Black Creek Field, AL).
- ❖ Site Characterization and Technology Training programs.

- **Mississippi:** Southern Company/MS Power Kemper County IGCC Project – initial CO₂ capture of 65 percent.

- **Virginia:** Dominion Virginia Power Virginia City Hybrid Energy Center – 585 MW CCS ready plant by 2012. The site is near the SECARB coal seam project.



CCS Projects in the Southern Region



- **West Virginia:** AEP Mountaineer Plant – began operating 20 MW CO₂ capture unit in September 2009 with geologic storage of ~100,000 tonnes CO₂/year. By 2015, commercial scale-up of capture unit with geologic storage of ~150,000 tonnes CO₂/year.
- **West Virginia:** TransGas Development Systems CTL Project – nation's first Reference CTL facility in Mingo Co. will be CCS ready.



Natural Gas



**Natural gas use is expanding
as a base load generating option**

- **Short lead time**
- **Easier to site**
- **Lower carbon emissions**
- **Lower capital costs**
- **Small increments of capacity**
- **Shale plays**





Renewable Energy



➤ Potential National Renewable Energy Standard

➤ 29 State Renewable Standards

- ❖ North Carolina: 12.5% by 2021
- ❖ Texas: 5,900 MW by 2015
- ❖ Oregon, Minnesota: 25% by 2025
- ❖ New York: 25% by 2013

➤ Potential Resources

- ❖ Woody Biomass
- ❖ Landfill Methane Gas
- ❖ Solar, Wind, Geothermal

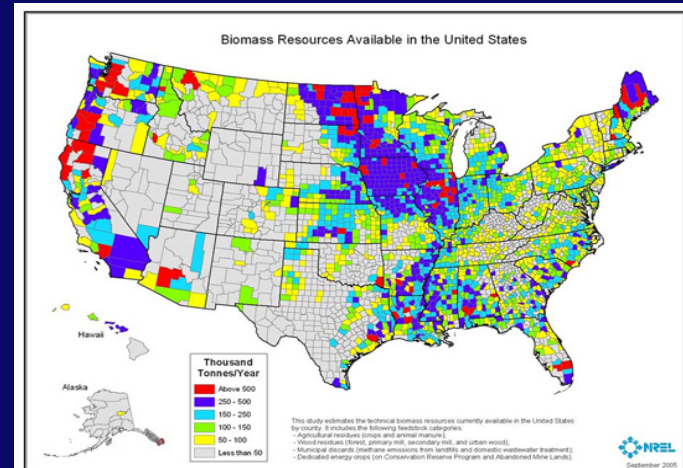




Renewable Energy: Biomass



- South's most abundant renewable energy source
- Appamattox Bio Energy Plant (VA): 60 million gallon per year ethanol plant will operate primarily on barley from VA and NC
- Oglethorpe Power Corporation (GA): plans to build as many as three 100MW biomass electric generating facilities using woody biomass



Renewable Energy: Biomass

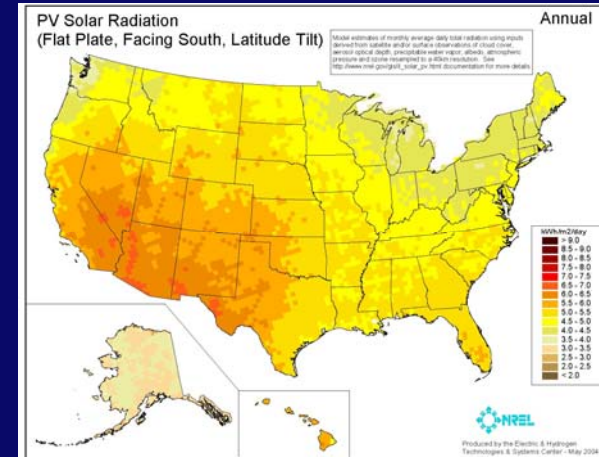
- Range Fuels (GA): currently constructing the nation's first commercial cellulosic biofuels plant; production scheduled to begin Spring 2010
- Bell BioEnergy (GA): uses unique bacteria to process waste biomass into hydrocarbon molecules, which can be blended together to form different fuels such as gasoline or diesel
 - ❖ reached an agreement with the Department of the Army to place 7 demonstration facilities on 6 Army Bases and 1 Defense Energy Support Center installation



Renewable Energy: Solar

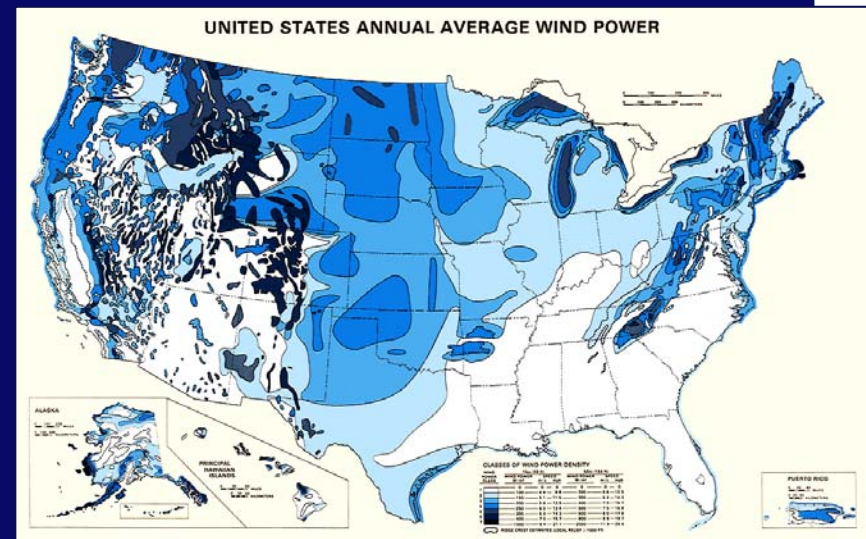


- Cloud Cover, Darkness are key
- Water use is a challenge
- FPL Group (FL): 110MW at 3 sites and 75 MW PV solar plant
- Duke Energy (NC): 16 MW PV solar farm plus 10 MW solar energy system



Renewable Energy: Wind

- Wind Speed is key
- Capacity Factor: 25-35%
- 31,100 MW in US
- Growth: 32%/year for past 5 years
- 8,400 MW added in 2008
- 5,600 MW under construction





Wind Power Projects in the Southern Region



- **Missouri**
 - ❖ Wind Capital Group: four wind farms in NW Missouri with a combined capacity of 162.5 MWs provide generation for 61,400 homes
- **Oklahoma** - Horizon Wind Energy's Blue Canyon Wind Farm
 - ❖ Blue Canyon I: 45 Vestas NM72 1.65 MW turbines and installed capacity of 74 MW
 - ❖ Blue Canyon II: 84 Vestas V80 1.8 MW turbines and installed capacity of 151 MW
 - ❖ Blue Canyon V : 66 GE sle 1.5 MW turbines and installed capacity of 99 MW.
- **Texas**
 - ❖ Sweetwater, Texas wind plant more than doubled in capacity to 585MW
 - ❖ Buffalo Gap wind facility expanded to 353MW
 - ❖ Capricorn Ridge wind facility produces 364MW



Wind Power Projects in the Southern Region



- **Virginia**
 - ❖ Highland County Wind Farm: First utility scale wind plant which will consist of 20 400 foot turbines
- **West Virginia**
 - ❖ Ned Power Project in Grant County: Largest wind farm in the East at 264 MW
 - ❖ Mountaineer Project in Tucker County : West Virginia's first wind farm produces 66 MW
 - ❖ Mt. Storm in Grant County: 461 MW wind farm has received regulatory approval and is under construction
- **Other Projects**
 - ❖ Dominion Virginia Power and BP Wind Energy North America Inc. are evaluating wind energy projects in Tazewell County, VA and Wise County, VA

EPA Rules & Regulations (Proposed & Final)

- **Coal Combustion Residuals (Coal Ash) Rule** - Proposed
- **Endangerment Finding** – Final
- **GHG Tailoring Rule & Prevention of Significant Deterioration (PSD) Rule** – Final
- **Mandatory Reporting of Greenhouse Gases Rule** - Final
- **Underground Injection Control (UIC) Program for CO₂ Geologic Sequestration Wells** – Proposed
- **Memorandum to Improve EPA Review of Appalachian Surface Coal Mining Operations (various Acts and Orders)** – Issued April 1, 2010
- **Mountaintop Mining Reviews**
- **Hydraulic Fracturing Reviews** - Under Consideration





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