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# Coal's 2014 Challenges & Opportunities – Role of the States

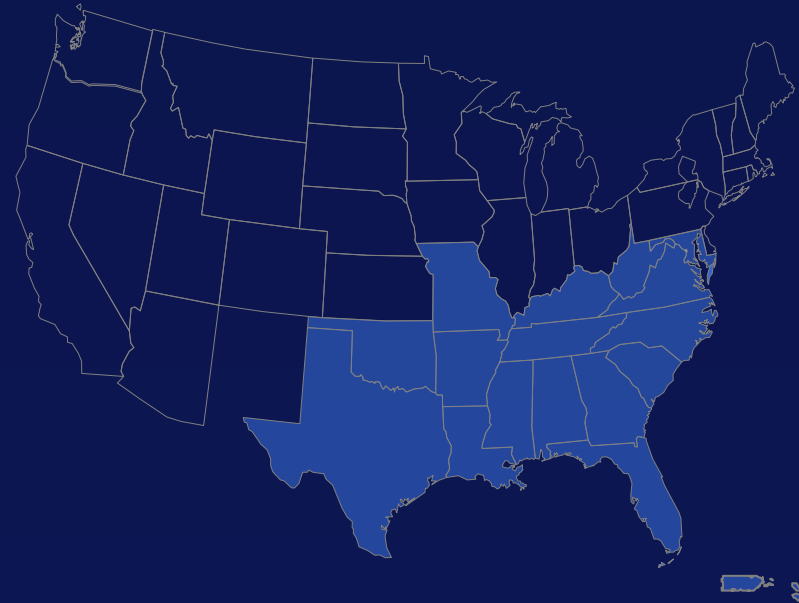
Presented by:  
Kenneth J. Nemeth  
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# Background

***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

WE'RE GOING TO TRY FITTING A NEW CAP..

"dunce"

U.S. ENERGY POLICY

IF THE HAT FITS... -

TDS

7@2010 THE WASHINGTON POST

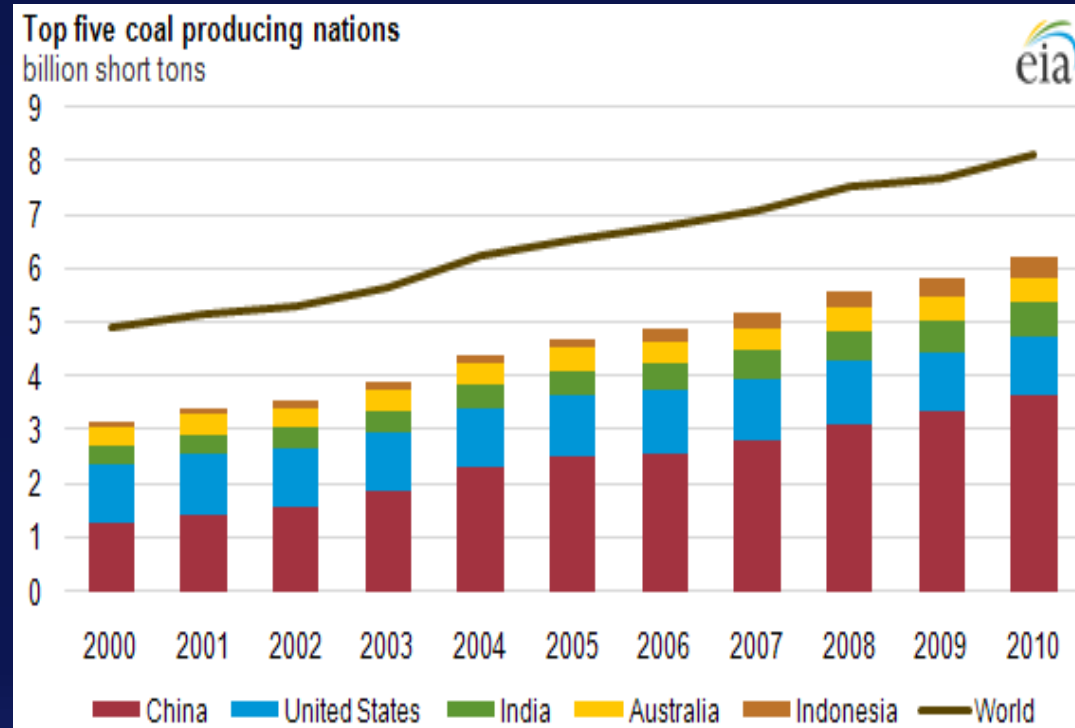
# Setting the Stage - Internationally

U.S. is:

- First in oil & gas production
- Second in coal production
- In top 10 using coal for Electricity generation

U.S. in top 5 coal exporters

Coal provides ~30% of primary energy needs and 41% of world's electrical generation



# International Energy & Environmental Challenges

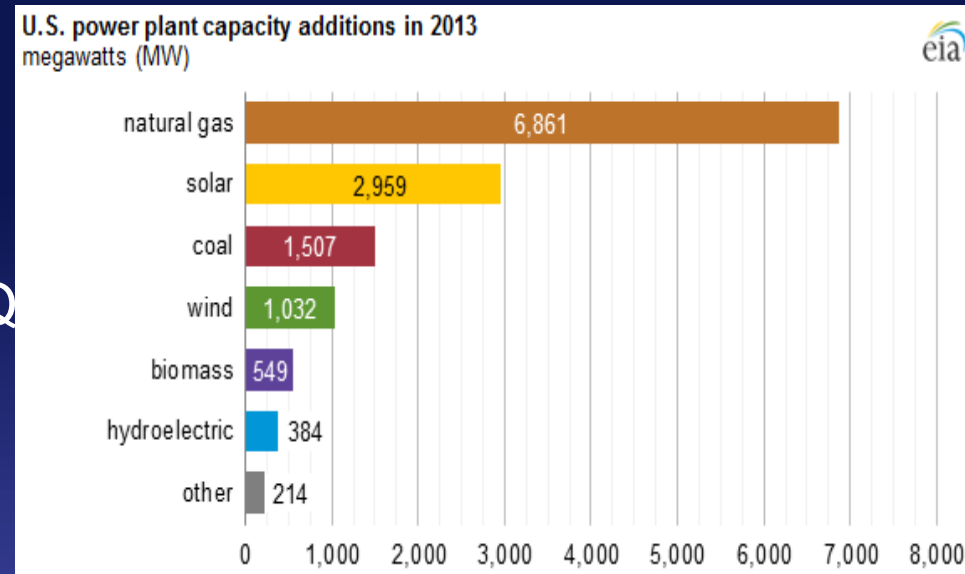
- Increasing energy demand (2-3x increase)
- Water scarcity including drought in many areas
- Reducing pollution in electrical production
- Reducing GHG emissions to mitigate climate change
- Country-wide decisions to eliminate generating options – Germany Energiewende
- International instability threatens supplies



# Setting the Stage – Nationally

## 1<sup>st</sup> Half 2014 (compare to 2013) - EIA

- U.S. primary **energy consumption** 50 Q
  - +3% from 2013
  - Natural Gas + 5%
  - Coal + 3%
  - Nuclear + 1%
- U.S. primary **energy production** 42 Q
  - +5% from 2013
  - Crude oil +15%
  - Natural Gas +5%
  - Renewables +4%
- U.S. primary **energy imports** 12 Q
  - Down 6% from 2013
- U.S. primary **energy exports** 6 Q
  - Up 8% from 2013



# Setting the Stage: Southern Region

- **South produces over ½ U.S. energy supply, serves 40% of population**
  - 7 of top 10 southern states lead manufacturing jobs per capita
  - Robust, innovative energy supply: traditional fuels, renewables and energy efficiency
  - \$5 Trillion economy
- **Key energy production**
  - 3 of top 5 coal, oil, and natural gas producing states in South
  - 66% of natural gas supply from South
  - 4 states produce >50% of U.S. domestic crude oil
  - WV, KY & TX produce 25% of nation's coal (among top 6 coal states)
- **South leads nuclear and renewable fuels output**
  - 26 nuclear plants operating, 5 units under construction
  - TX, OK and WV have 16 GW of wind capacity
- **States adopting energy efficiency measures**
  - WV and MS -'Most Improved' energy efficiency programs (2014 ACEEE Scorecard)
  - AR prioritizing energy efficiency





# Challenges to the Electric Grid

- EPA regulations – Climate Action Plan, coal ash regs
- Perceptions of fossil fuels
- Reliability concerns with coal plant closures
- Electricity sales
- Electricity cost-low income
- Coal R&D funding dwindling
- Changing Utility Business Model
- U.S. leadership in clean coal technology





# EPA Proposed Standards for CO<sub>2</sub> Emissions for the Coal Fleet

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- **Standards for new coal fired power plants – June 2014**
  - Clean Air Act 111 (b) requires EPA to establish standards for new and modified stationary sources
  - Standard reflects degree of emissions limitation achievable through the application of best system of emission reduction that has been adequately demonstrated
- **Standards for existing coal fired power plants – June 2015**
  - Clean Air Act 111 (d) requires EPA to establish standards for existing stationary sources
  - Standards will become a part of State Implementation Plans to be completed by June 2016

# Highlights of EPA Proposed 111(d) Ruling – Clean Power Plan

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- States have different standards based on generating mix  
MS - 692; SC -772; AR - 910; WV -1620; KY - 1763 # CO<sub>2</sub> / MWH - examples
- States have flexible paths for meeting CO<sub>2</sub> standards
- Strategies can include these and other solutions- Increase:
  - Power plant efficiency at coal plants
  - Dispatch of natural gas in lieu of coal
  - Renewable and nuclear generation
  - Energy efficiency
- Multiple States can develop regional solutions (e.g. RGGI)
- Industry projection quotes EPA models forecast 121 GW of capacity will be retired 2016-2020, 68 GW directly in response to 111(d) rule

# Comments on Proposed Clean Power Plan

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- Original EPA 120 day comment period extended until December 1, 2014
- EPA Held 4 Listening Sessions
  - Public comments
  - Currently over 750,000 comments (per EPA speaker)
- Fifteen State Governors & Attorneys General
- Utilities
- “Energy Producing States Industry Group”
  - Provide a ‘glide path’ to meet goals
  - Natural gas infrastructure is a top priority
  - Reliability concerns with coal plants closing
- Numerous studies underway

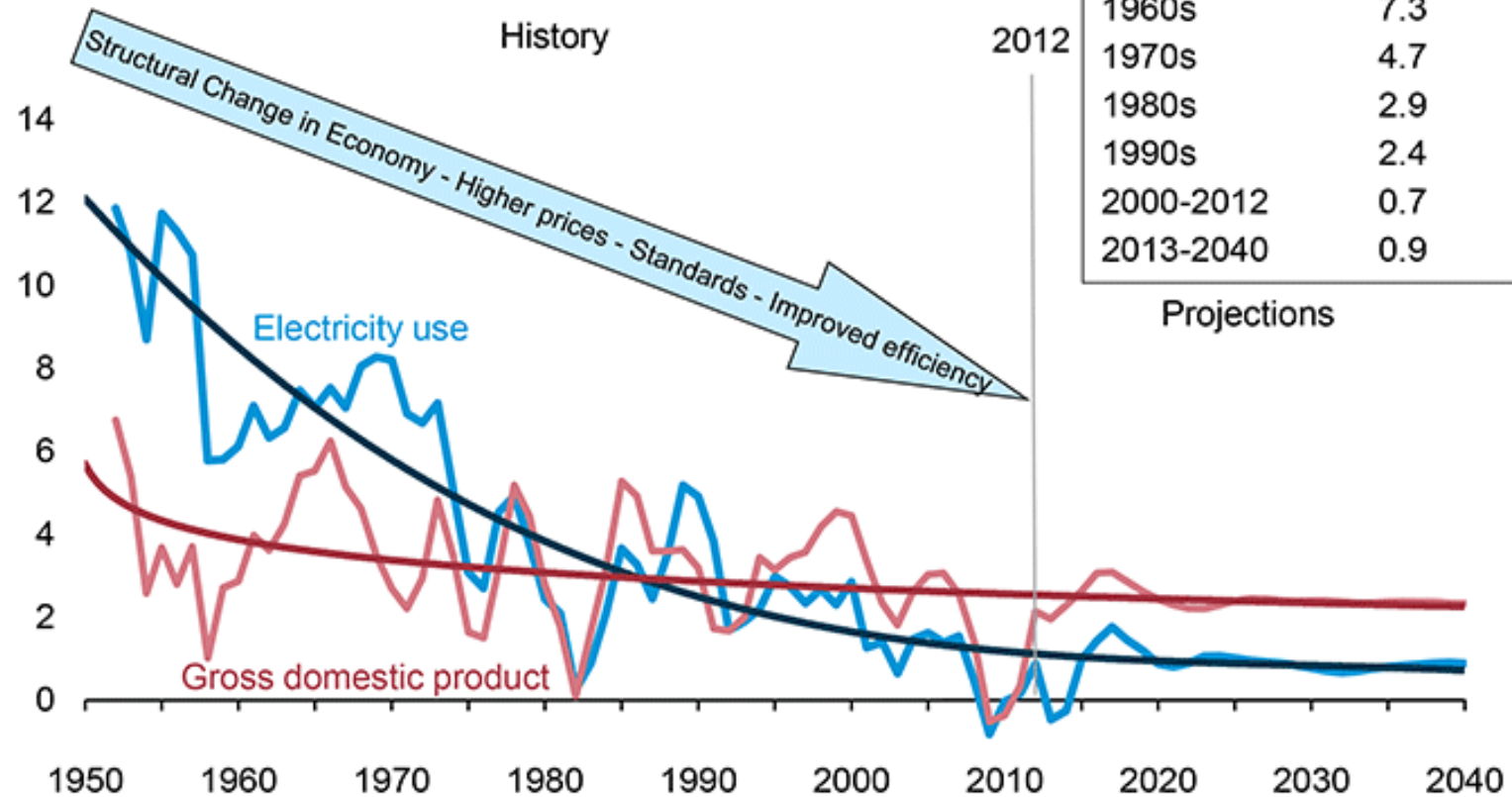
# Forecast of Coal Plant Retirements

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- August 2014 Report: *EPA Regulations and Electricity Update* by GAO
- Coal fired generating capacity
  - 2012 coal capacity: 1,309 coal fired generating units with 310 GW of capacity- 29% of US capacity
  - 42 GW of capacity has been/to be retired by 2025
- Characteristics of Plants being retired
  - Small
  - Old (75% of coal plants > 30 years)
  - Less environmental controls
  - Lower use
  - Generally concentrated in:
    - OH 14% , PA 11%, KY 7%, WV 6%

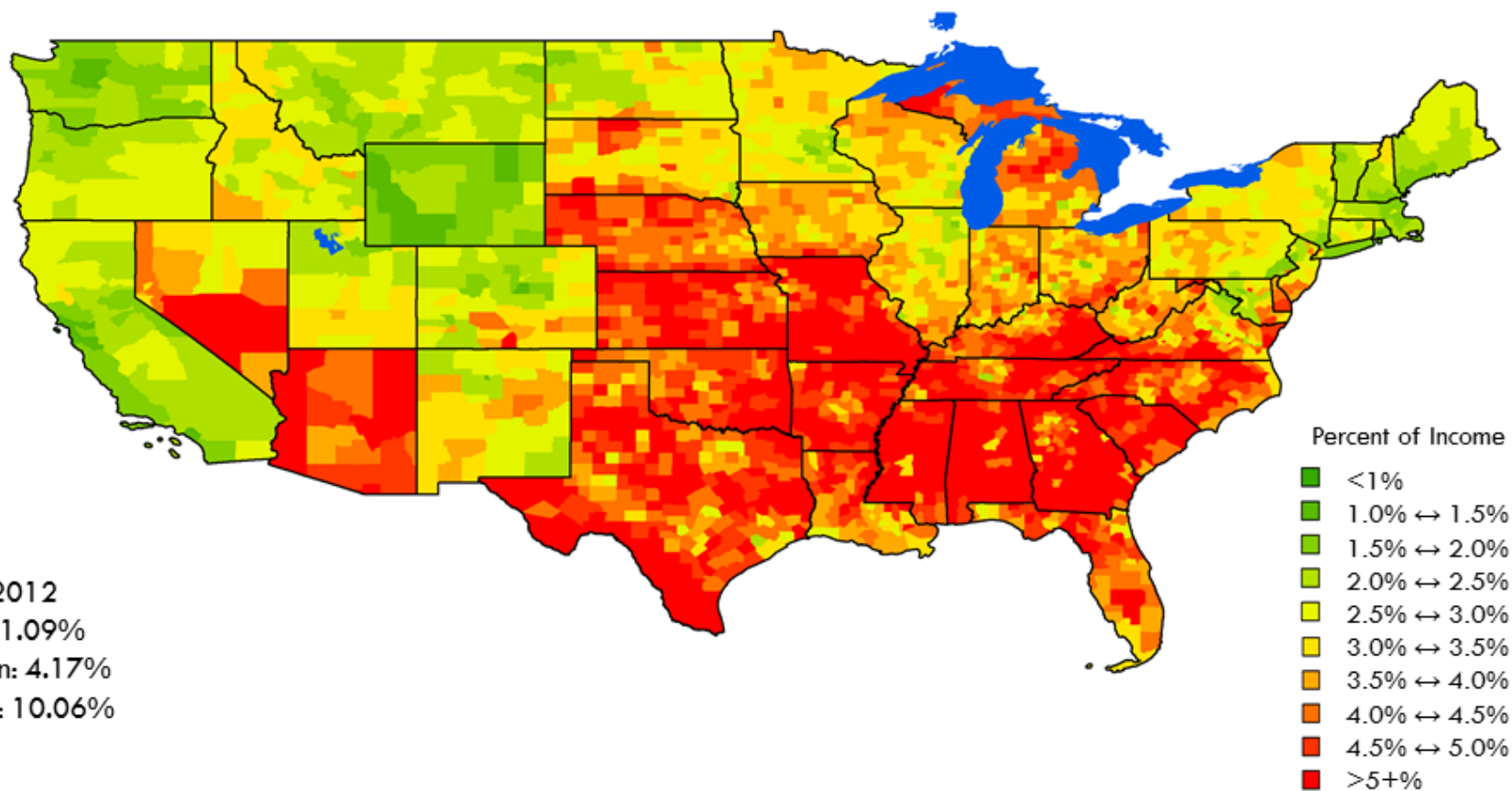
# Growth in electricity use slows, but still increases by 28% from 2012 to 2040

U.S. electricity use  
percent growth (3-year rolling average)



Source: EIA, Annual Energy Outlook 2014 Early Release

## United States Household Electricity Expenditures as a Percentage of Income Summer 2012



07/2012

Min: 1.09%

Mean: 4.17%

Max: 10.06%

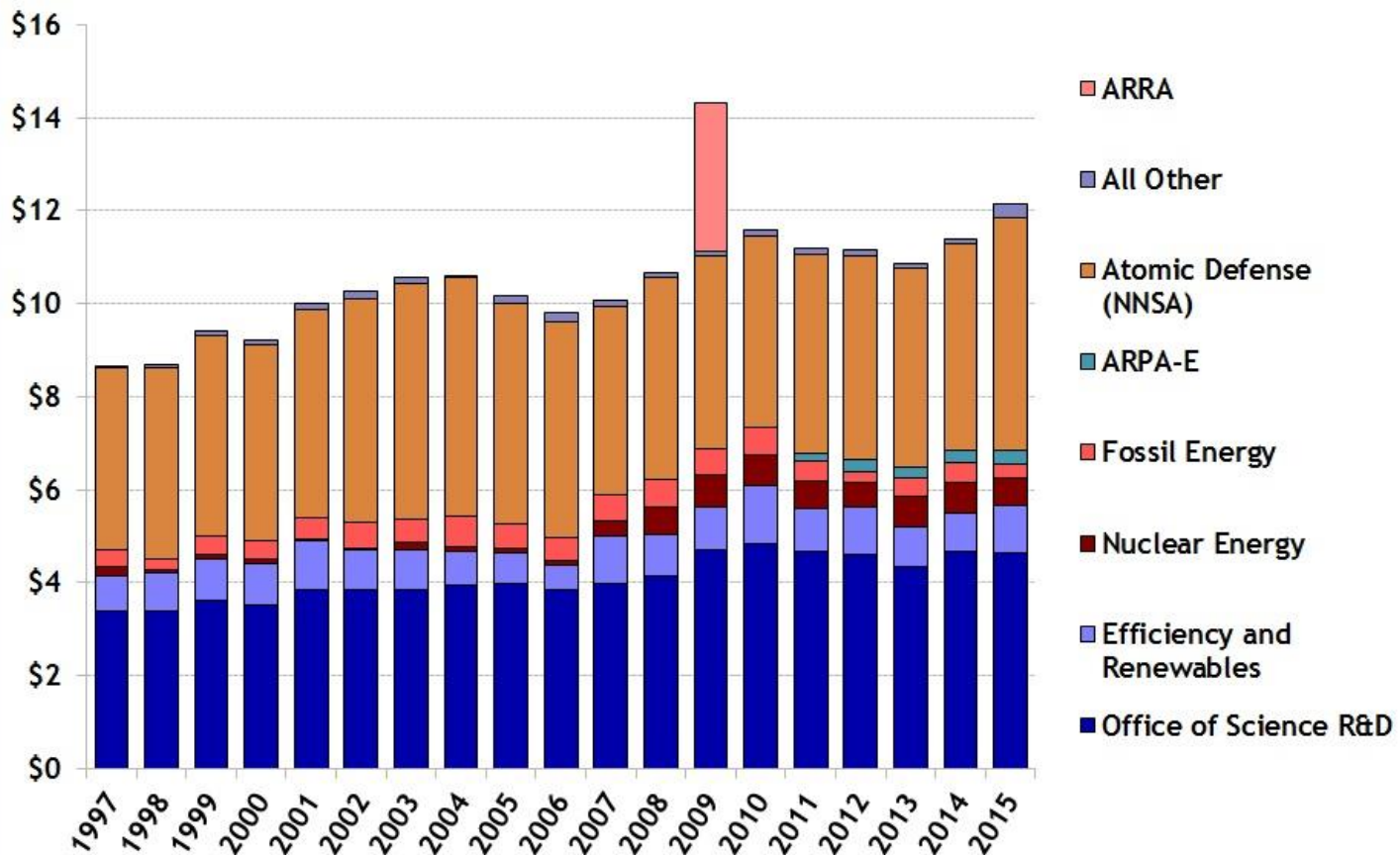
Electricity expenditure data collected by electric service provider by the Energy Information Administration in Form EIA-826 and EIA-861, median household income data collected by the United States Census Bureau American Community Survey. Residential electricity bills vary by household and month not only with electricity prices, but also weather, housing quality, home size, occupancy, personal usage, and method of home heating. Household expenditures for direct heating with fossil fuels such as natural gas, propane, or fuel oil are not reflected in these data.



# R&D Funding 1997 - 2015

## Trends in DOE R&D, FY 1997-2015

in billions of constant FY 2014 dollars



Source: Past AAAS R&D reports, OMB and agency budget documents, and appropriations documents. R&D includes conduct of R&D and R&D facilities. © 2014 AAAS

# Challenges to the Utility Business Model



- **Electricity growth flat**
  - Pre-Recession growth has not returned
  - Continued energy efficiency improvements drive down growth
- **Distributed Generation (solar, efficiency, DSM) eroding revenue**
  - Potential reshaping of the traditional Revenue model
- **Gas prices low are driving decisions on other assets**
  - Natural gas combined cycle plants being built
  - Gas units dispatch ahead of coal in some cases
  - In some markets, nuclear generation cannot compete
- **Utility Integrated Resource Plans: Coal retirements often best**
  - Coal capacity aging
  - Environmental regulations increasing risk & cost of coal
- **Price of renewable energy dramatically dropped in 2-3 years**
- **Nuclear energy in the South to increase (6 GW at 5 new units)**
- **Natural gas infrastructure needs**
- **Electricity-Gas Market Integration coordination needed**

# Opportunities for Coal & Utility Rebirth

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- Innovation in recent new coal generating units
- Innovations in large-scale gasification projects
- CO2 pipelines
- State legislation related to coal use
- Transmission investments up!
  - CREZ in Texas
  - Expenditures across the region
- SECARB innovations
- “All of the Above” for U.S. generating supply
- Continued use of coal as major resource in South

# Environmental Attributes of New Generating Capacity

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- Kemper County IGCC – MS (May 2015)
  - 65% CO2 Capture
  - Use of indigenous lignite coal
- Virginia Hybrid Energy Center (July 2012)
  - 600 MW Circulating Fluidized Bed Technology
  - Fuel: Coal plus up to 20% Biomass
  - Low SO2, NOx, Particulate matter, mercury, water use
- J. W. Turk Power Plant - AR (Dec. 2012)
  - 600 MW Ultra Supercritical- Temperatures >1100 degrees F.
  - SCR, Low NOx, dry FGD system; reduced mercury emissions
  - Fuel: Low sulfur, Powder River Basin coal from WY
- CCS-EOR Project at Parish plant – TX (Planned for 2016)
  - Partnership: JX Nippon & NRG with 90% CO2 capture and 82 mile transport for EOR (includes \$167 M DOE funds)

# Pending Large-Scale Gasification Projects



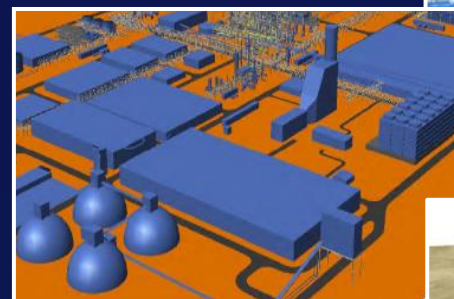
## Mississippi Power Company

- Kemper County IGCC Project
- Power, CO<sub>2</sub> for EOR



## Summit Power

- Texas Clean Energy Project
- Power, urea, CO<sub>2</sub> for EOR



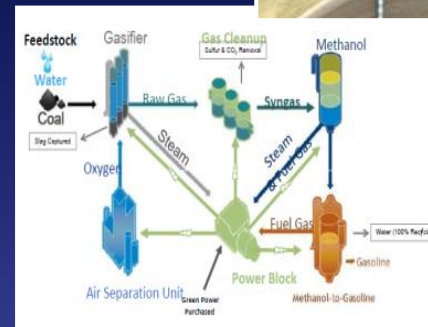
## Hydrogen Energy California

- HECA
- Power, urea-based fertilizers, CO<sub>2</sub> for EOR



## DKRW Advanced Fuels

- Medicine Bow Fuel & Power
- Gasoline, CO<sub>2</sub> for EOR



# Opportunities to Increase Coal Operations through State Legislation

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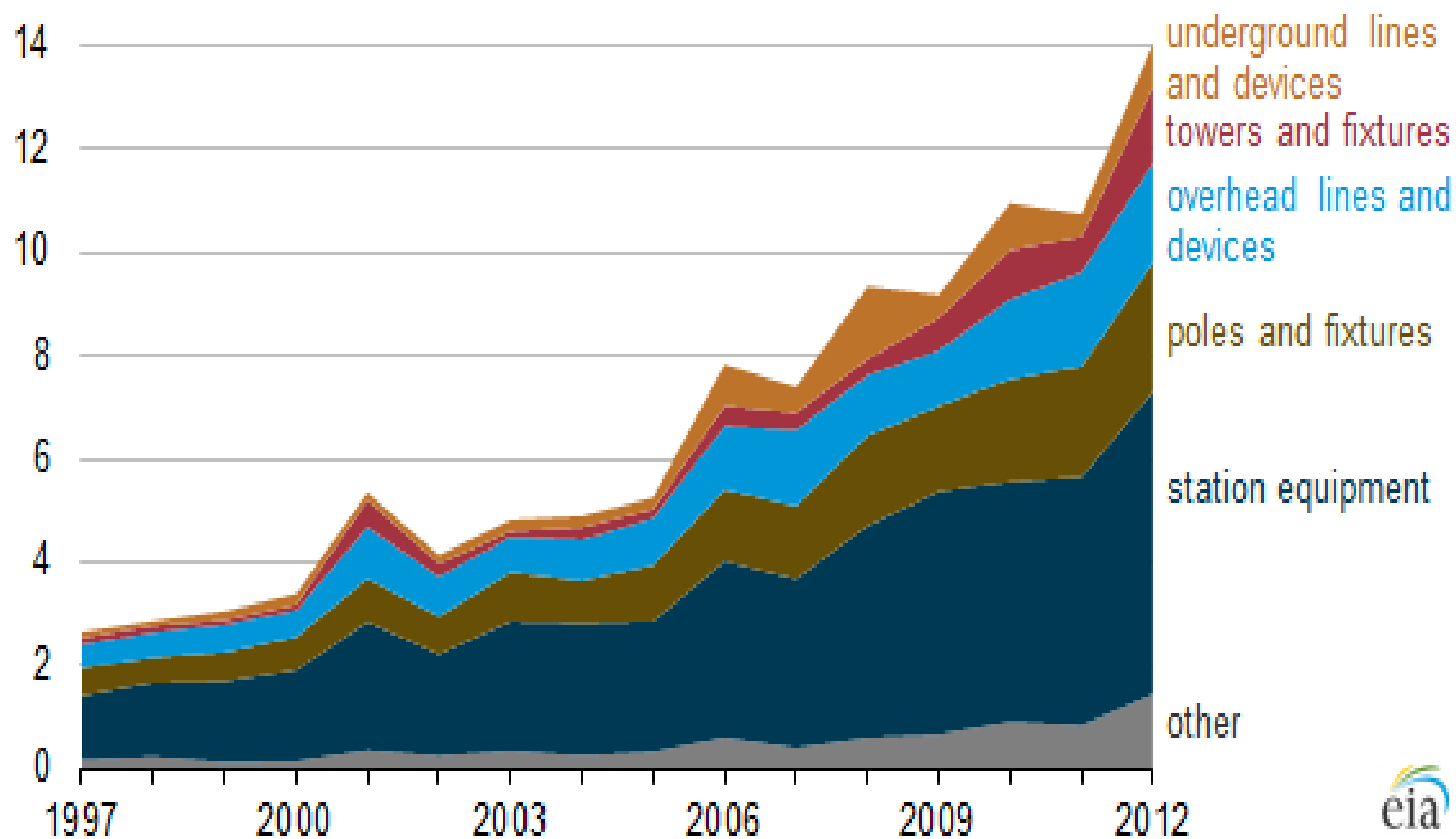
[www.sseb.org](http://www.sseb.org)

- **Bills Affecting Utilities and the Coal Industry**
  - Kentucky – Establishment of Reclamation Guaranty Fund
  - Michigan – Redefined standards for fly ash
  - Ohio– Cogeneration qualifies to meet RPS
- **Greenhouse Gas Legislation**
  - Wyoming – Established state primacy for GHG Rules
  - West Virginia – Eliminated State GHG Reporting
- **Pipeline & EOR Legislation**
  - Montana – Defines Common Carrier for CO2 Pipelines
  - Mississippi - Reduces Sales Tax on Power for EOR/ Sequestration
  - Texas – Tax Credit for Natural Gas CCS & EOR
  - Texas – Provides CO2 Pipeline Regulation by Railroad Commission



# Investment in transmission infrastructure by investor-owned utilities (1997-2012)

billions of 2012 dollars

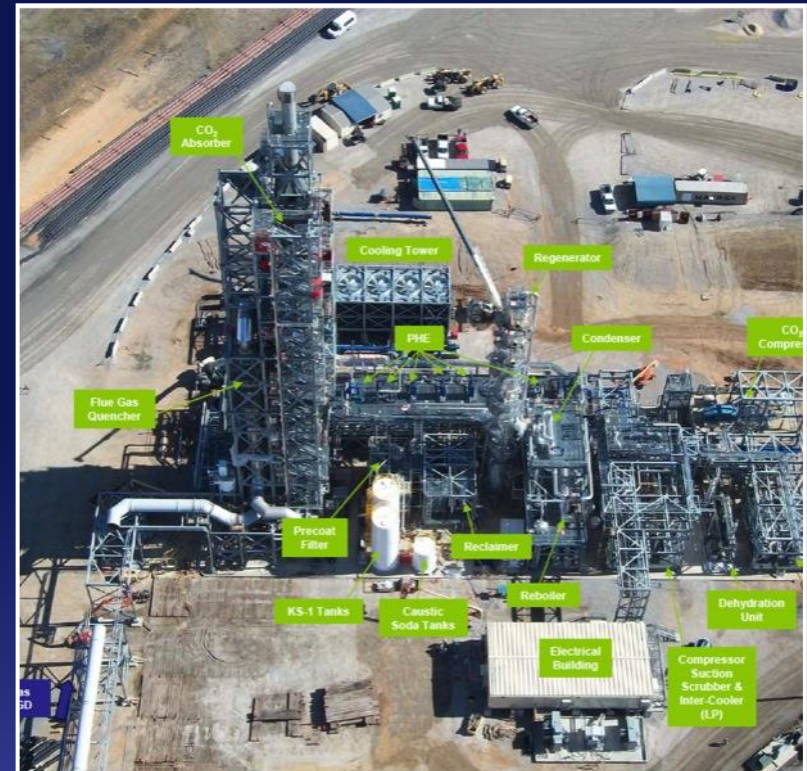


# Southeast Regional Carbon Sequestration Partnership Demonstration Projects



SECARB Early Test  
Cranfield, MS

SECARB Anthropogenic Test  
Plant Barry



# SECARB: Leading CCS Innovation



- Early Test (MS) First Partnership to:
  - Inject CO<sub>2</sub> in Phase III
  - Monitor 1 million metric ton injection (Fifth worldwide)
- First time in EOR/Storage setting, placed pressure gauges in above-zone monitoring interval to test retention in Cranfield reservoir
- Developed field method for soil gas monitoring (used at Kerr in CAN)
- First to inject CO<sub>2</sub> under power plant at Plant Daniel (MS)
- Anthropogenic Test (AL):
  - World's largest fully integrated CO<sub>2</sub> capture, transport and storage project using CO<sub>2</sub> from coal-fired power plant
  - Eight countries have toured test site (Including Canada, Norway, Belgium, Japan, Italy, Spain and UK)
  - First deployment of Modular Borehole Monitoring (MBM) flat pack for CCS in saline reservoir

# “All of the Above”: Other Electric Supply Options



- Natural Gas – Combined Cycle
- Nuclear
  - Several unit retirements due to market conditions & equipment
  - New capacity
    - Plant Vogtle, GA – 2 units
    - South Carolina – 2 units
    - Watts Bar unit 2 – TVA
    - Duke (SC) – awaiting approval but not committed to build
    - Additional Georgia Power nuclear units being considered
- Compressed Air Energy Storage – AL and TX
  - CA PSC requires 1,325 MW of energy storage on grid by 2020
- Solar
- Wind and associated Transmission
- Hydroelectric generation- rehabilitation and small head hydro

# Energy Facts in the South (2013)

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- **Electricity consumption** 47% of national consumption
  - 50% of residential consumption
  - 48% of commercial/ industrial consumption
- **Electricity production** 42% of national electricity generated
  - 52% of natural gas generation nationwide generated in the southern region
  - 43% of coal fired generation
  - 41% of nuclear power generation
  - 30% of wind generation
- **Electricity Prices (South v nationwide)**
  - Residential: 10.96 cents/KWh v 12.12
  - Commercial: 8.97 cents/KWh v 10.29
  - Industrial: 6.09 cents/KWh v 6.82
  - Average: 9.08 cents/KWh v 10.08

# It's Not a "One Size Fits All" World!

## Predominantly Coal

- WV, Kentucky >93%
- Missouri 83%
- Arkansas 52%
- Maryland, Tennessee, OK 40-45%
- NC, TX, AL, GA 30-39%
- MS, LA, FL, SC, VA <30%

## Predominantly Natural Gas

- Mississippi, Florida >60%
- Louisiana 51%
- Texas 47%
- Oklahoma 41%
- Missouri, WV, TN, KY ~5%+/-

## Predominantly Nuclear

- South Carolina 57%
- TN, VA, MD, North Carolina 30-41%
- Georgia, Alabama 27%
- Oklahoma, Kentucky, West Virginia 0%



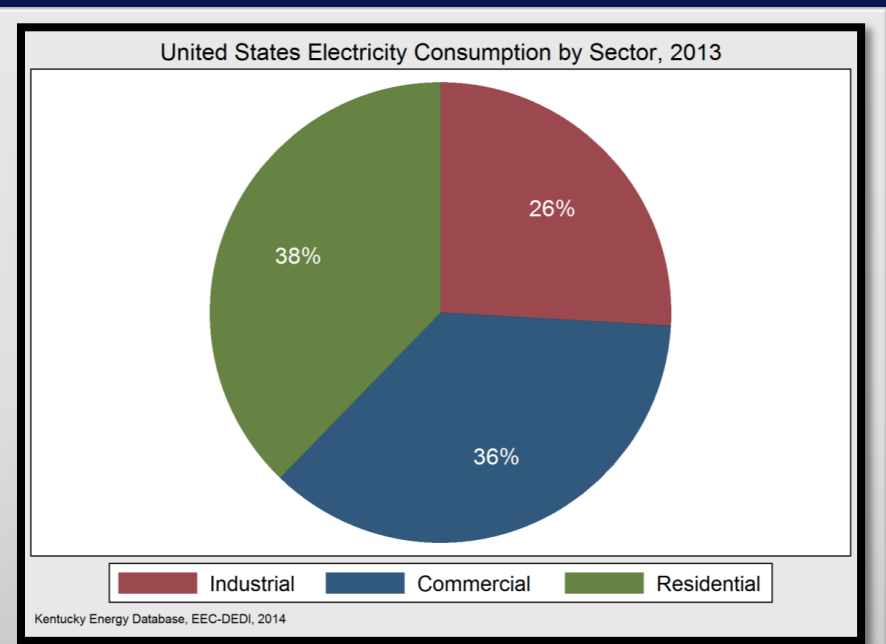
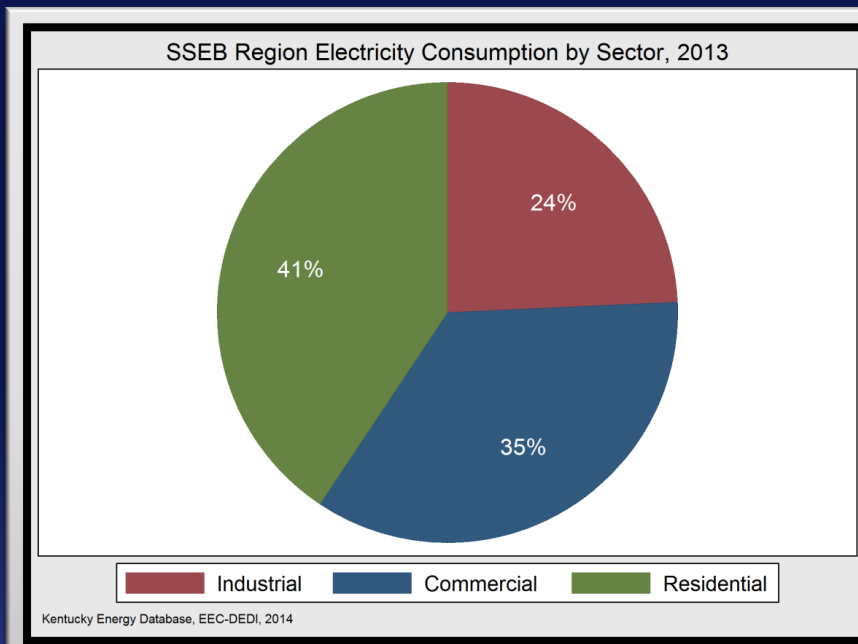
# Electricity Consumption 2013 – SSEB & U.S.



[www.sseb.org](http://www.sseb.org)

## SSEB Region Electricity Consumption by Sector, 2013

## United States Electricity Consumption by Sector, 2013



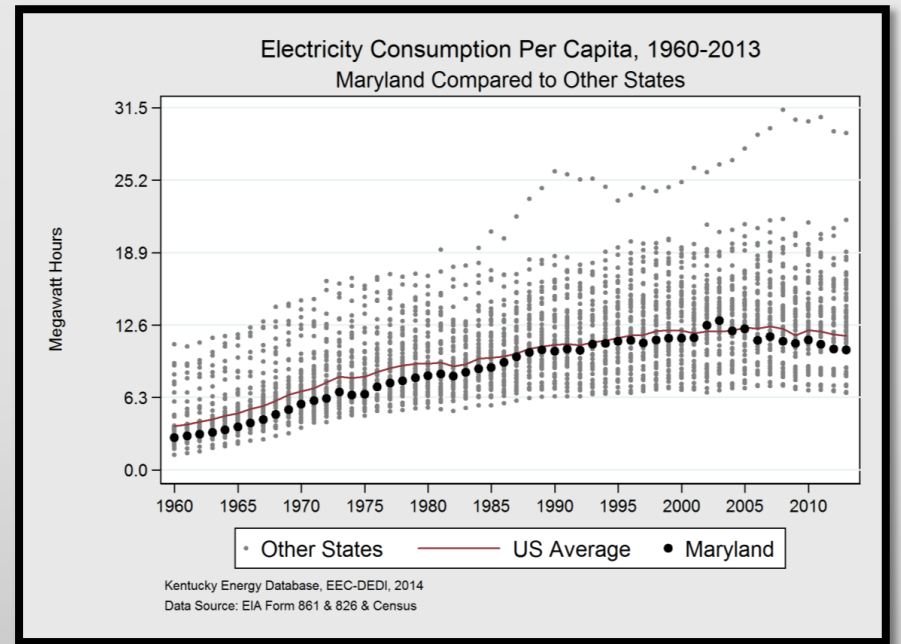
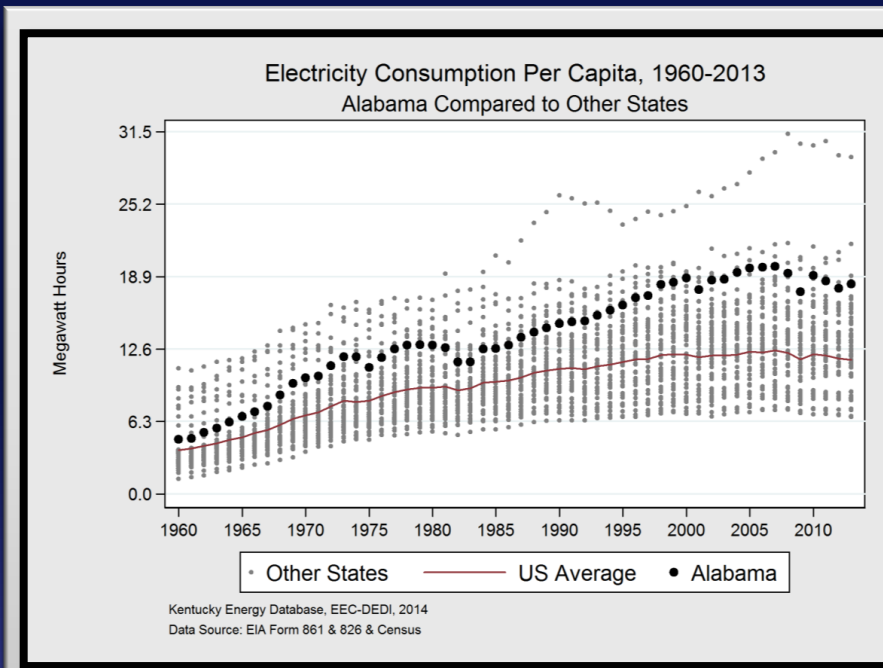
# Electricity Consumption Per Capita 1960 – 2013

## Alabama & Maryland



Electricity Consumption Per Capita –  
1960-2013: Alabama

Electricity Consumption Per Capita –  
1960-2013: Maryland

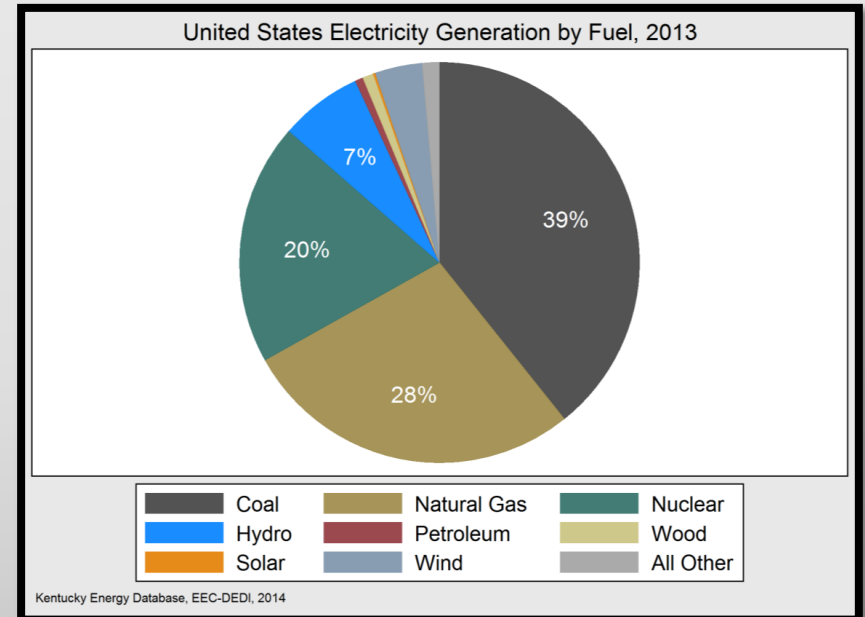
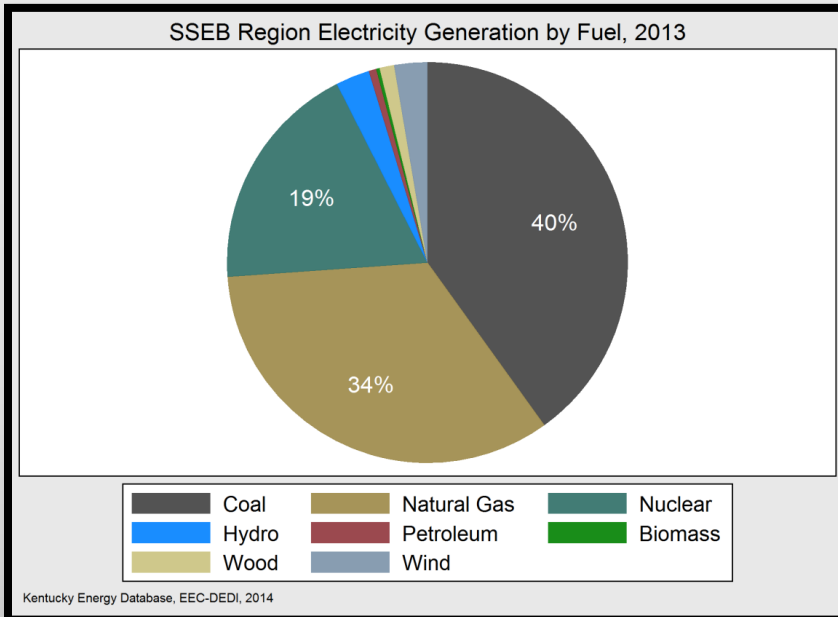


# Electricity Generation – SSEB & U.S.



## SSEB Region Electricity Generation by Fuel, 2013

## United States Electricity Generation by Fuel, 2013



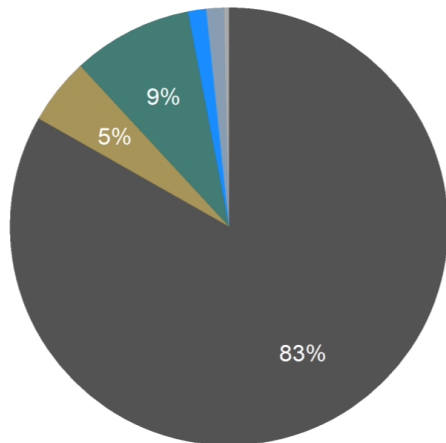
# Electricity Generation – Missouri & South Carolina



## Missouri Electricity Generation by Fuel, 2013

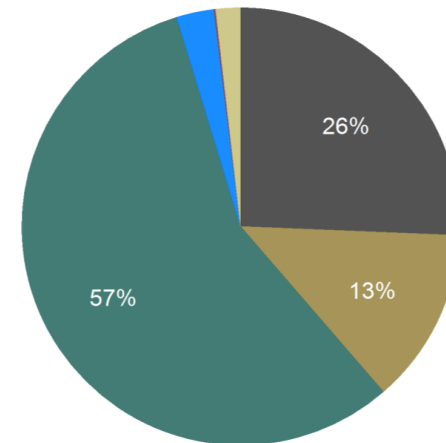
## South Carolina Electricity Generation by Fuel, 2013

### Missouri Electricity Generation by Fuel, 2013



Kentucky Energy Database, EEC-DEDI, 2014

### South Carolina Electricity Generation by Fuel, 2013



Kentucky Energy Database, EEC-DEDI, 2014

# Electricity Generation – Texas & Arkansas

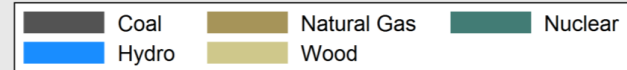
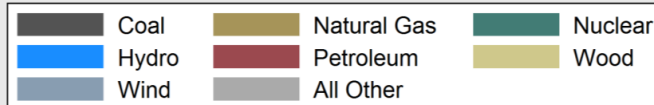
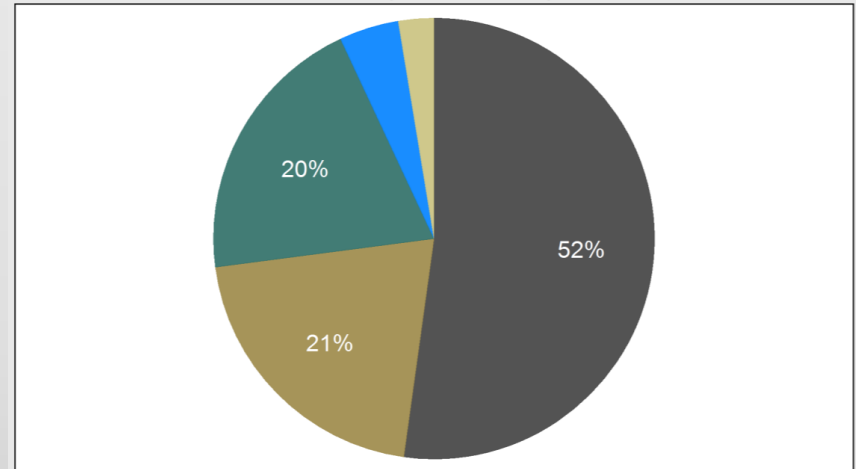
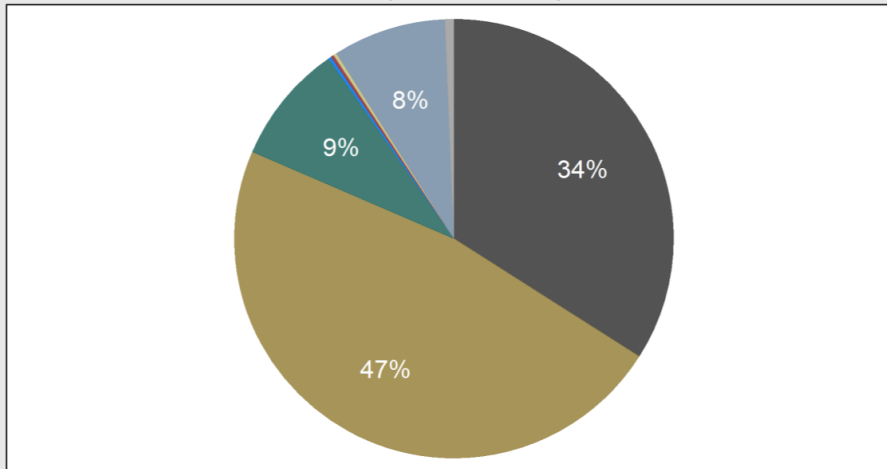


## Texas Electricity Generation by Fuel, 2013

## Arkansas Electricity Generation by Fuel, 2013

Texas Electricity Generation by Fuel, 2013

Arkansas Electricity Generation by Fuel, 2013



Kentucky Energy Database, EEC-DEDI, 2014

Kentucky Energy Database, EEC-DEDI, 2014

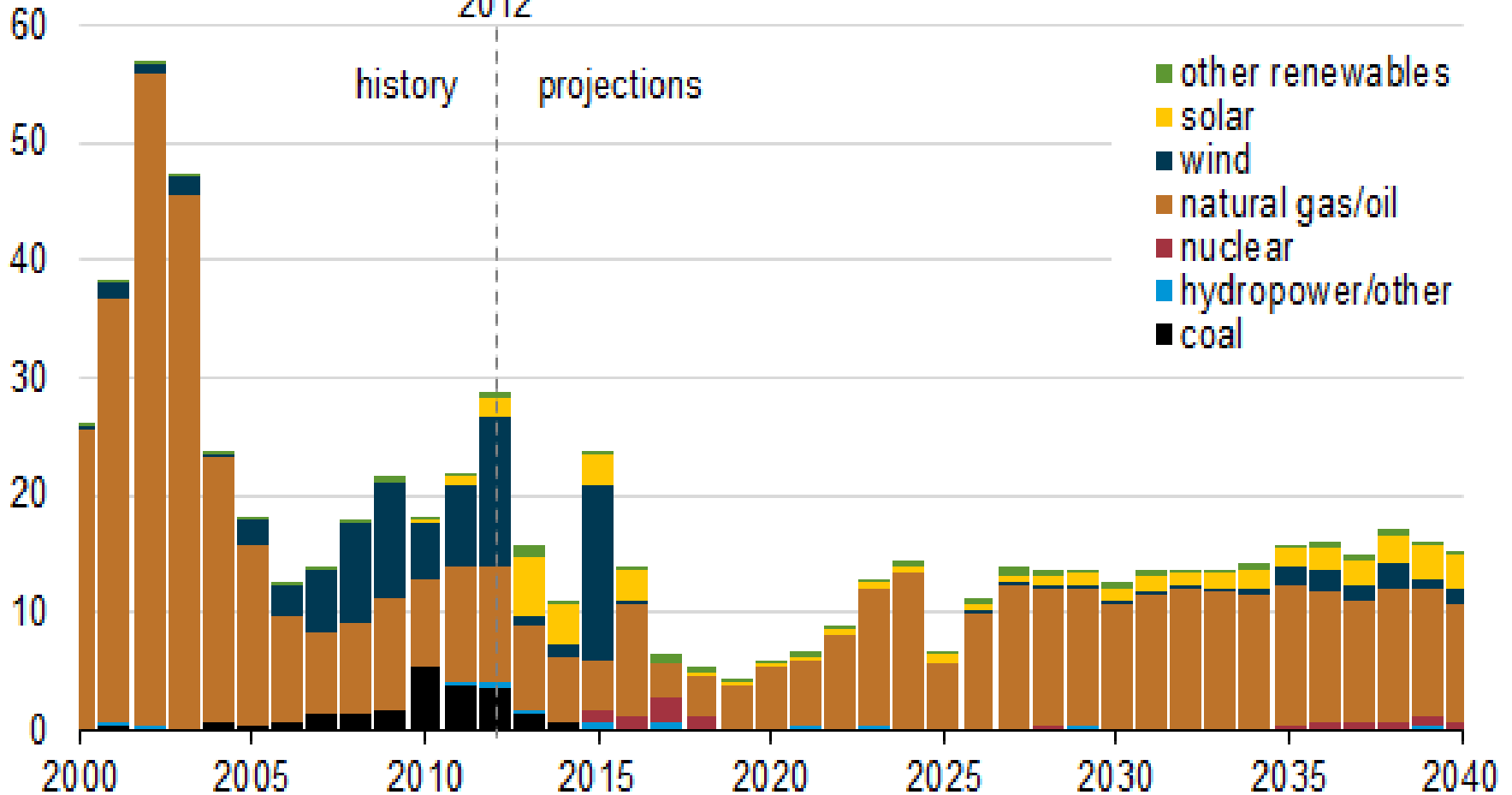
# Electric Generating Capacity Additions Projections through 2040



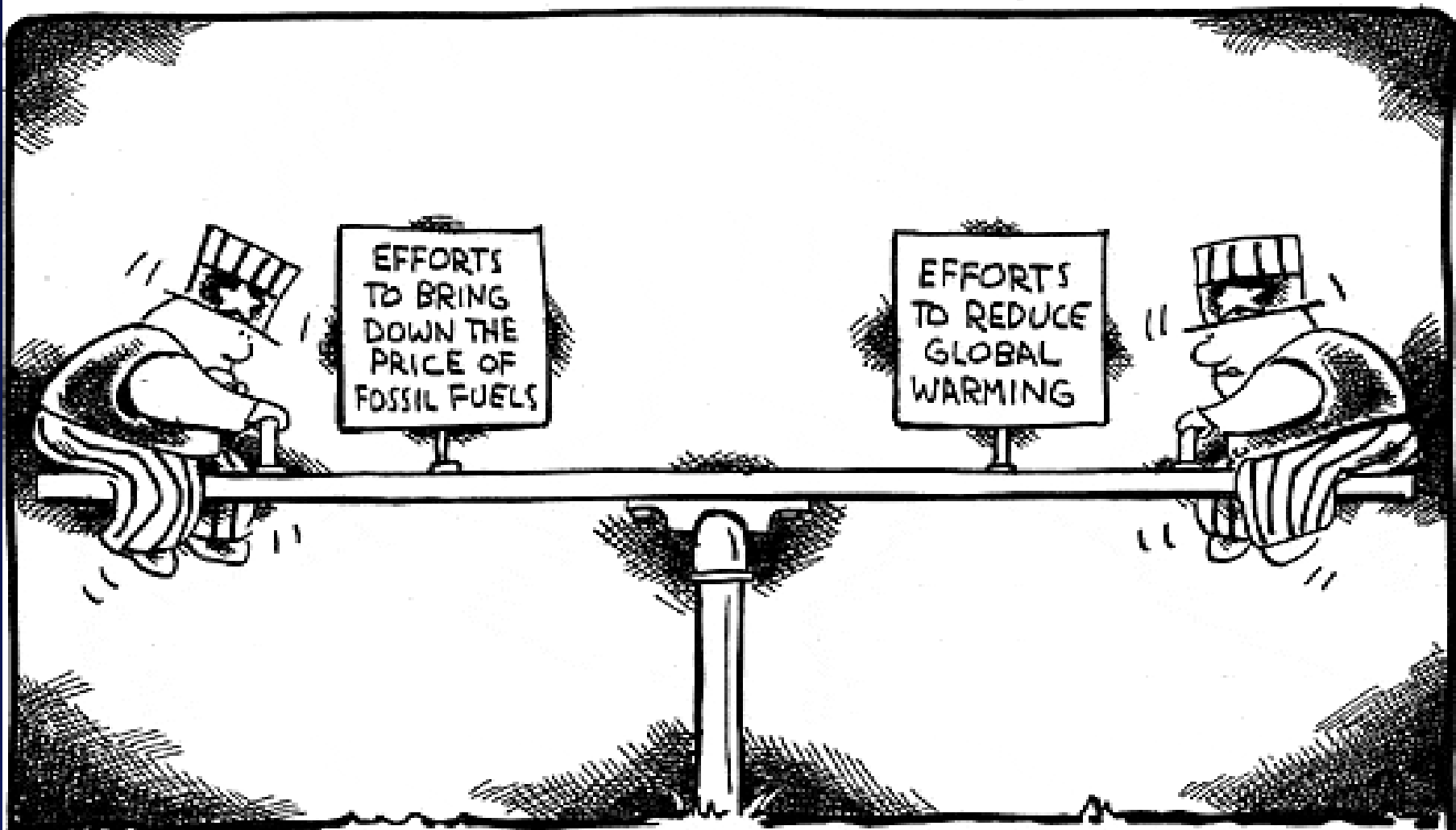
Electric generating capacity additions (2000-2040)



gigawatts







# Your Government at Work

**T.S.**

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NOT AN ALTERNATIVE ENERGY SOURCE. —



# State Solutions: SSEB Resolutions 2014

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- Resolution Supporting Fuel and Technology Diversity in the U.S. Electricity Generation Portfolio
  - Fuel and technology diversity are key strengths of electricity generation sector
  - IHS Energy report: continued shutdown of nuclear and coal would decrease household income \$2000 and drive down U.S. GDP by \$200 Billion
  - Reliable, efficient electric system requires diverse generation mix, tailored to demand patterns
  - Optimal mix will differ from one power system to the next
  - SSEB urges federal, state and local officials to work to preserve portfolio diversity
- Resolution Concerning EPA's Proposed GHG Emission Guidelines for Existing Fossil Power Plants
  - Proposed rule will cause disruptions in the electricity mix
  - Inadequate time for compliance
  - Forecasts of 46 – 49 GW of coal capacity could be shut down, 75% in SSEB
  - Funding CCS essential
  - Inadequate credit for nuclear /prior GHG reduction measures
  - SSEB urges EPA guidelines in best interest of each of the SSEB states



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