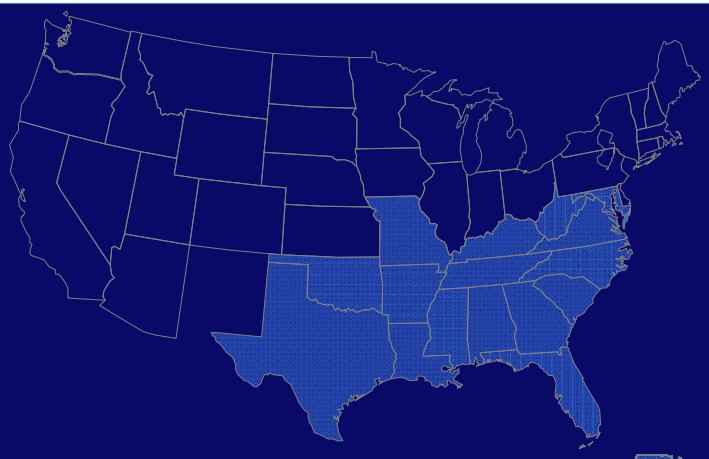
Energy in the South: Reducing Carbon Emissions in Electricity Generation

Presented to:
Greenprints Conference 2010
March 1, 2010

Presented by:
Gary Garrett

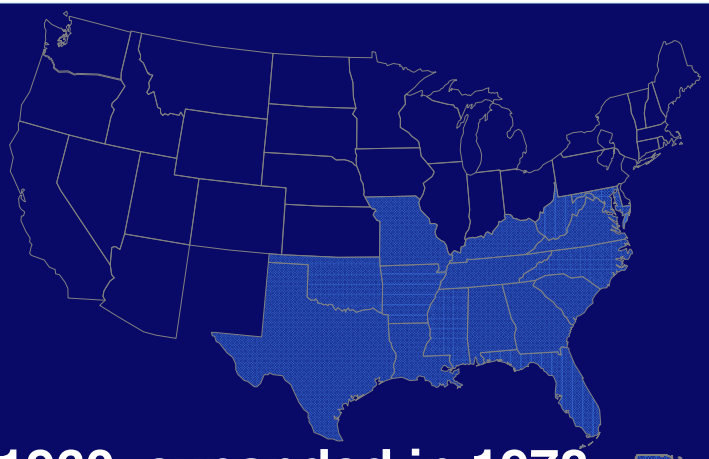
Background



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

Background



- 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

Initiated in August 2008 by West Virginia Governor Joe Manchin, Chair of the Southern States Energy Board

Strategic Action Plan – Energy Supply Blueprint

American Energy Security Study Phase II

- Energy Resources
- Climate
- Transportation
- Electricity

ENERGY RESOURCES

Global Energy Forms Face Limits in Supply & Price

All Energy Forms Needed for Diversity of Supply

- **ENERGY EFFICIENCY/DEMAND-SIDE MANAGEMENT/CONSERVATION:** An important resource; insufficient to power the future alone
- **OIL:** Consistently above $70/barrel; declining reserves; risky sources
- **NUCLEAR:** Valuable but constrained due to cost, safety and waste disposal concerns
- **HYDRO:** Minimal growth in supply

ENERGY RESOURCES

Global Energy Forms Face Limits in Supply & Price

All Energy Forms Needed for Diversity of Supply

- WIND: Limited availability; not base-load; intermittent supply
- ETHANOL: Clean but energy inefficient; cellulosic key
- NATURAL GAS: Price volatility; declining reserves; risky sources
- COAL: Faces GHG, climate change, finance ability, environmental challenges
- SOLAR: Cost of materials; regional effectiveness; intermittent

CLIMATE:
Carbon Tools Portfolio*

- Manage Carbon
  - Reduce demand for energy services
  - Increase efficiency in energy conversion & transport processes
  - Reduce carbon intensity or CO2 emitted per unit of energy
- Extract Carbon at the source
- Reuse – Enhanced Oil Recovery, feedstock for chemical products, carbonation
- Store or sequester CO2

*Recommendations of Sandia National Labs

TRANSPORTATION

Reducing Transportation-related GHG Emissions

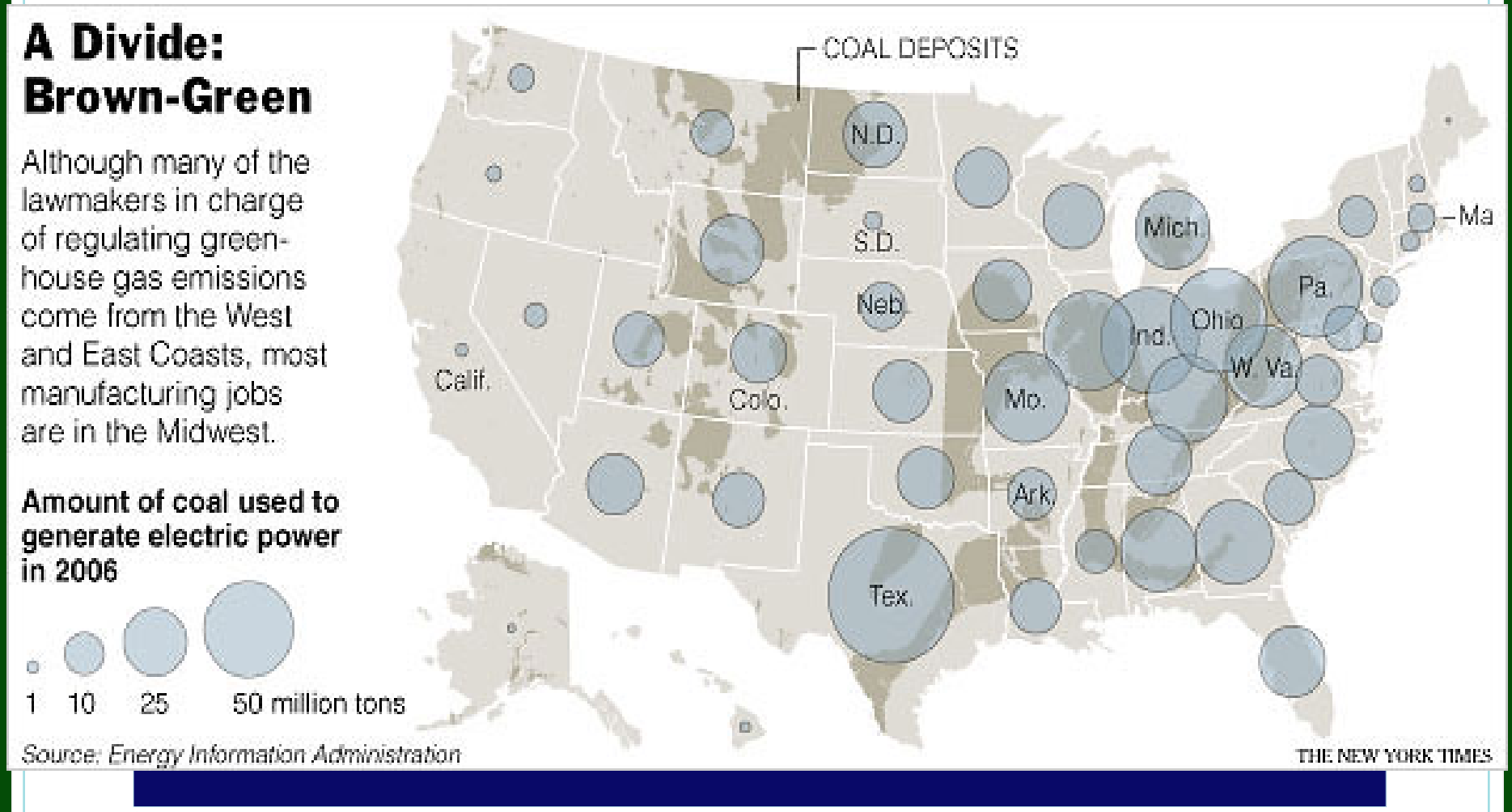
- Technologies – CAFÉ Standards
- Expanding Domestic Fuels – alternative fuels (Ethanol, Cellulosic biofuels, hydrogen / fuel cells, Coal To Liquids)
- Integrating Land use, Transportation Planning & Zoning
- Pass Open Fuels Standard Act – Flex Fuel Vehicle standard
- Development of high speed rail & expansion of Public Transit
- Freight efficiency
- Shipping, Rail and Air Transport efficiency

ELECTRICITY

Tenets in the Strategic Discussion

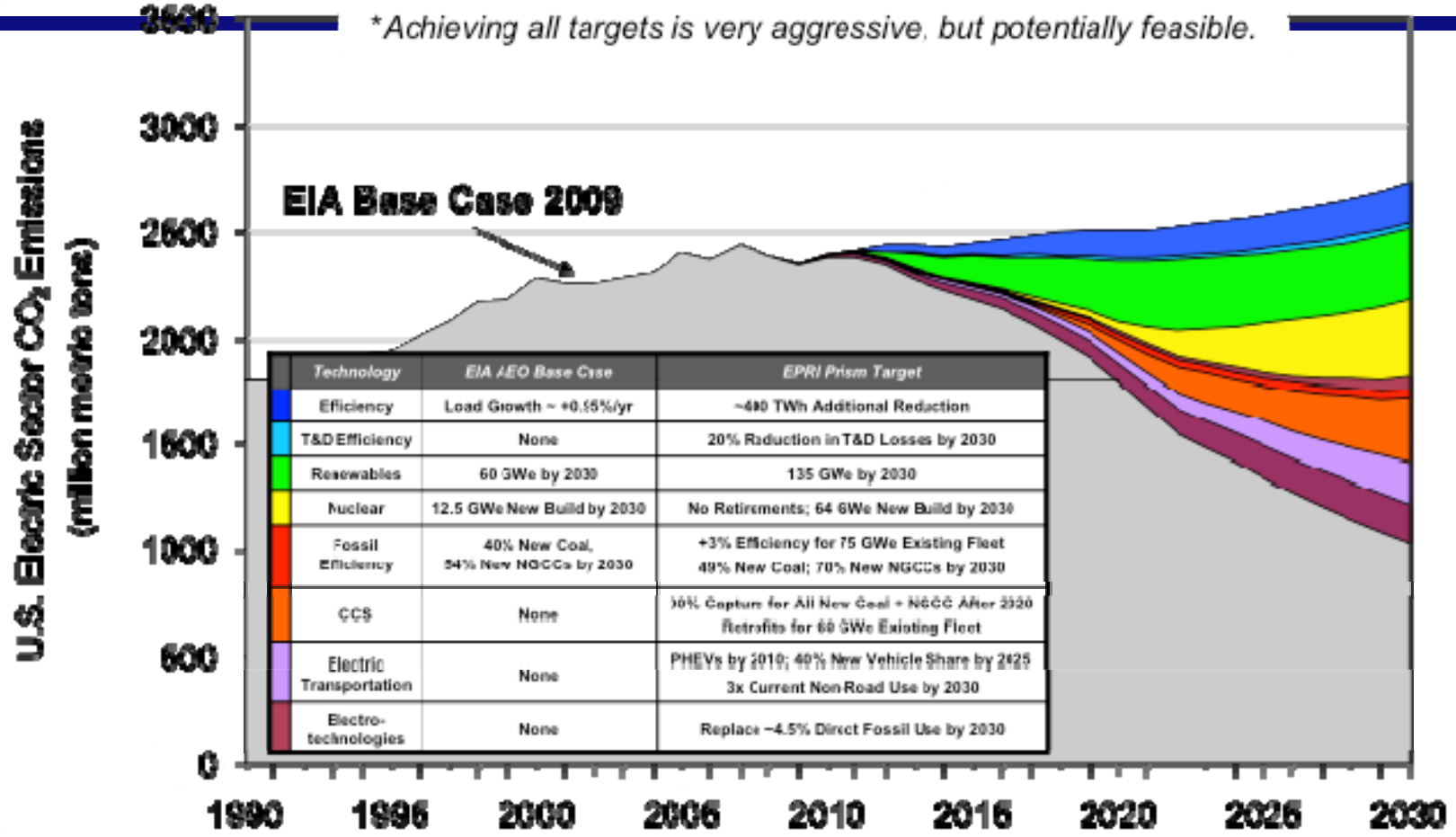
- Adequate electricity reserve capacity is essential
- Environmentally sustainable use of natural resources with stable, reliable electric energy grid
- Regulatory inaction delays Transmission development
- Diverse portfolio of electricity generation technologies is necessary for robust future

Coal as a Source of Electricity

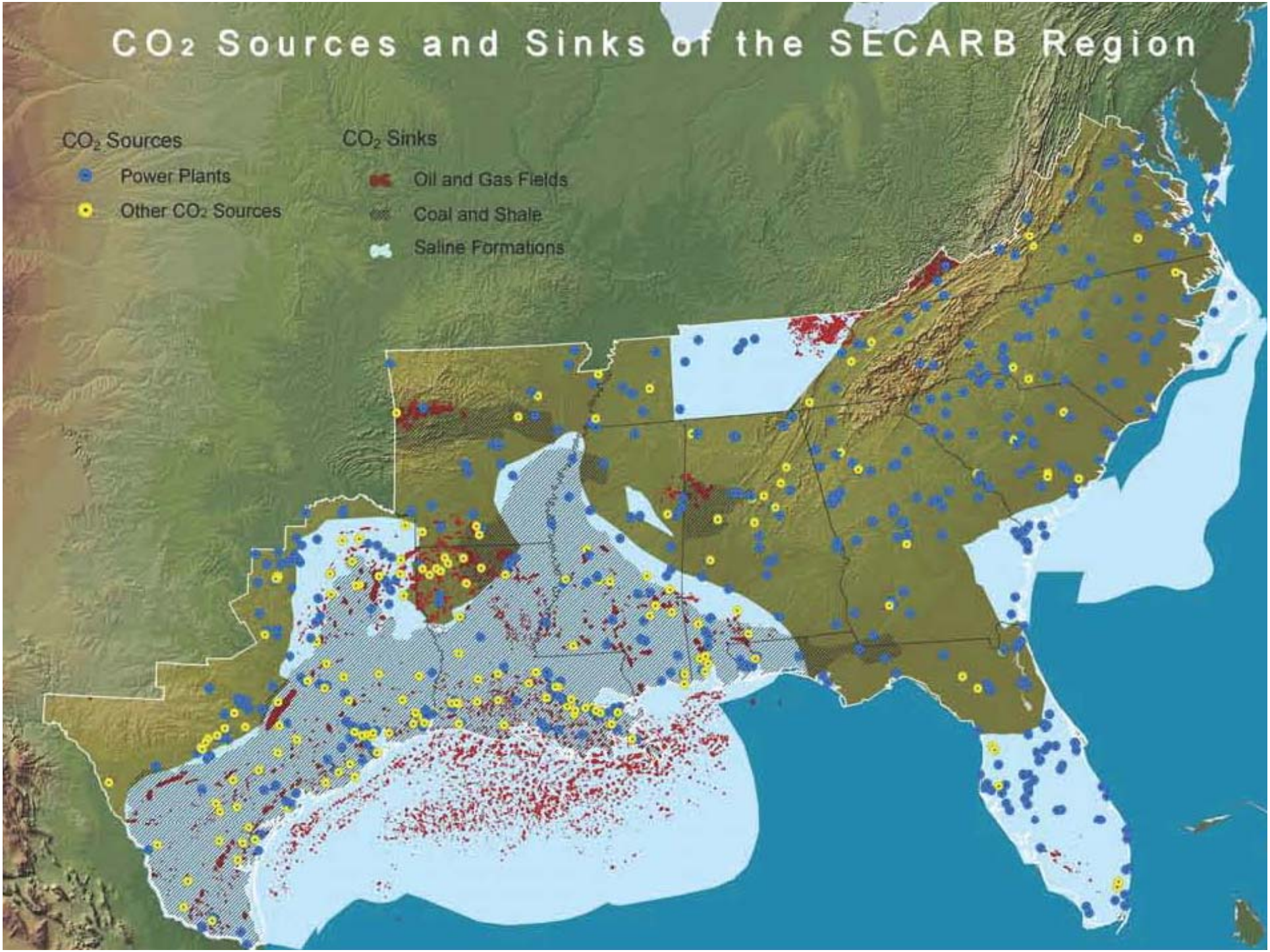


CO_2 Reductions … Technical Potential*

*Achieving all targets is very aggressive, but potentially feasible.

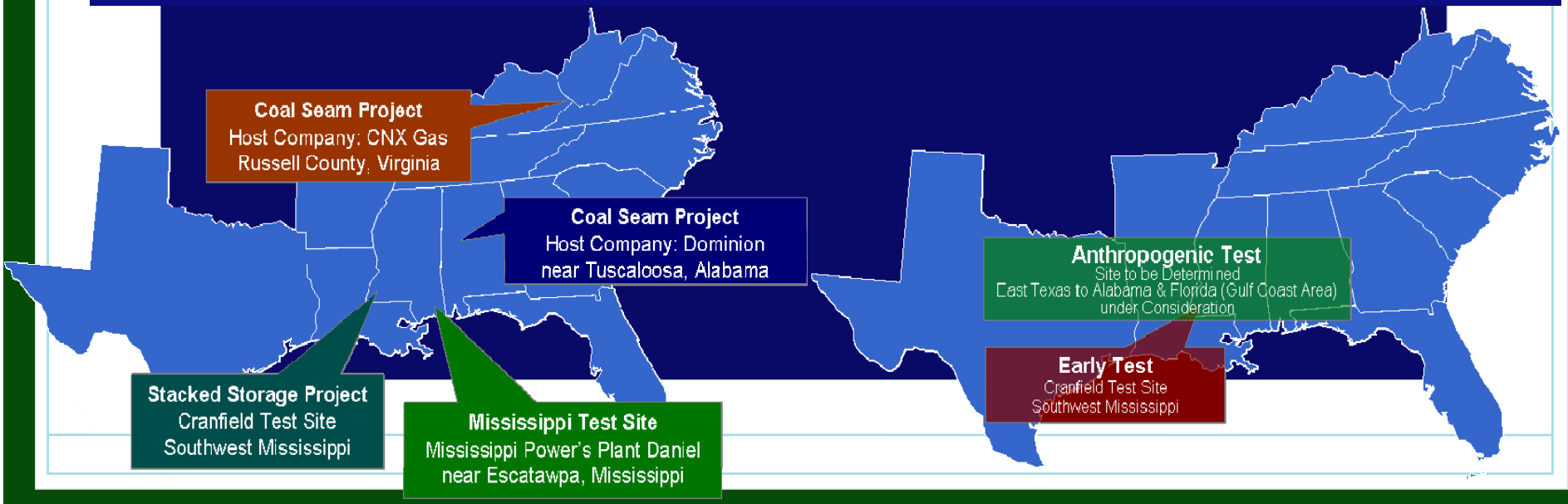


Technology	EIA AEO Base Case	EPRI Prism Target
Efficiency	Load Growth ~ +0.55%/yr	~400 TWh Additional Reduction
T&D Efficiency	None	20% Reduction in T&D Losses by 2030
Renewables	60 GWe by 2030	135 GWe by 2030
Nuclear	12.5 GWe New Build by 2030	No Retirements; 64 GWe New Build by 2030
Fossil Efficiency	40% New Coal, 94% New NGCCs by 2030	+3% Efficiency for 75 GWe Existing Fleet 40% New Coal; 70% New NGCCs by 2030
CCS	None	90% Capture for All New Coal + NGCC After 2020 Retrofits for 60 GWe Existing Fleet
Electric Transportation	None	PHEVs by 2010; 40% New Vehicle Share by 2025 3x Current Non-Road Use by 2030
Electro-technologies	None	Replace ~4.5% Direct Fossil Use by 2030

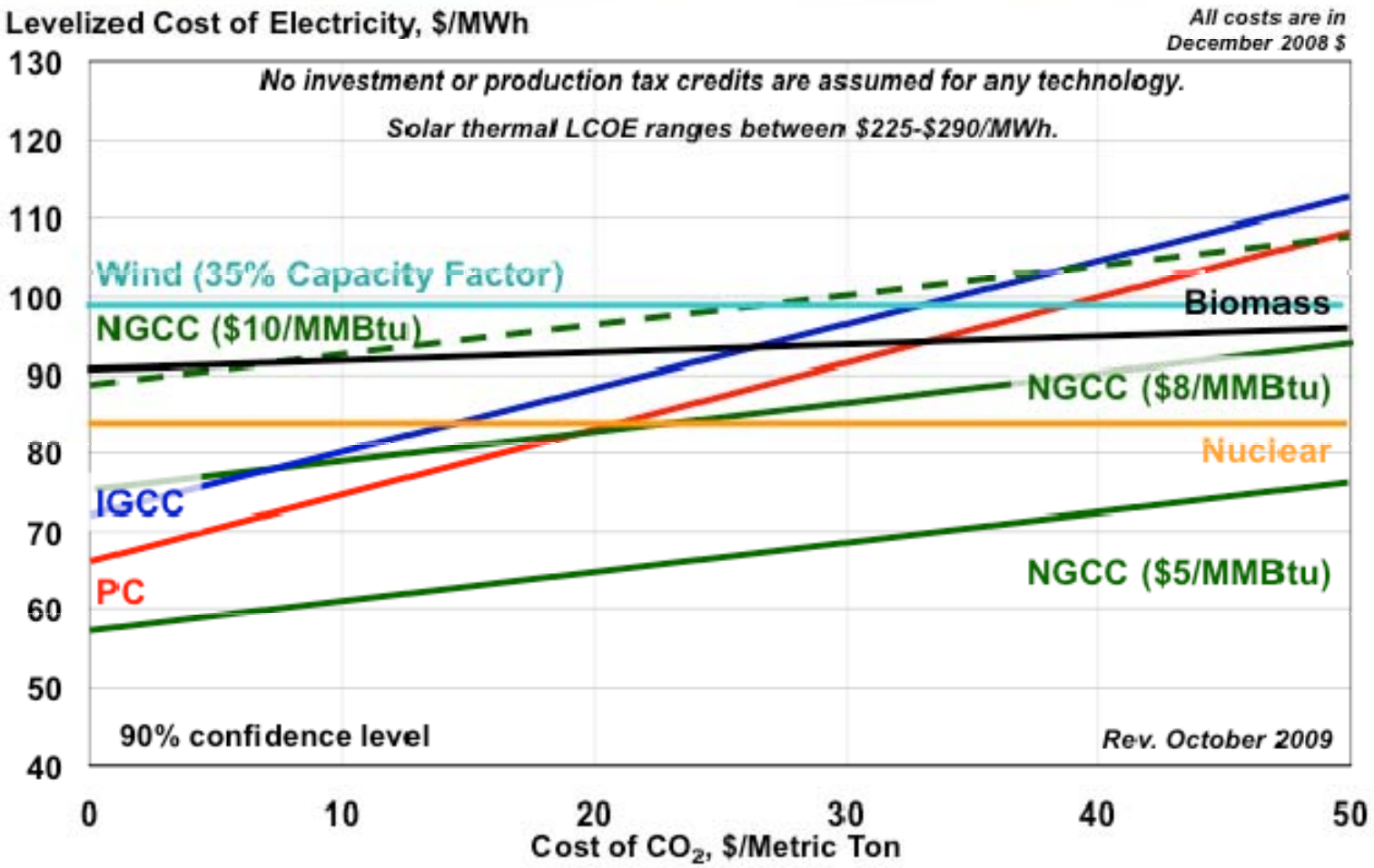

CO2 Sources and Sinks of the SECARB Region
CO2 Sources
Power Plants
Other CO2 Sources
CO2 Sinks
Oil and Gas Fields
Coal and Shale
Saline Formations

Carbon Management – Southeastern Carbon Sequestration (SECARB) Partnership

- Characterize potential carbon sequestration sinks
- Conduct field verification studies in promising geologic formations
- Advance monitoring, measurement and verification techniques
- Develop sequestration technologies , characterize geologic sinks



Comparative Levelized Costs of Electricity – 2015



EPRI ELECTRIC POWER RESEARCH INSTITUTE

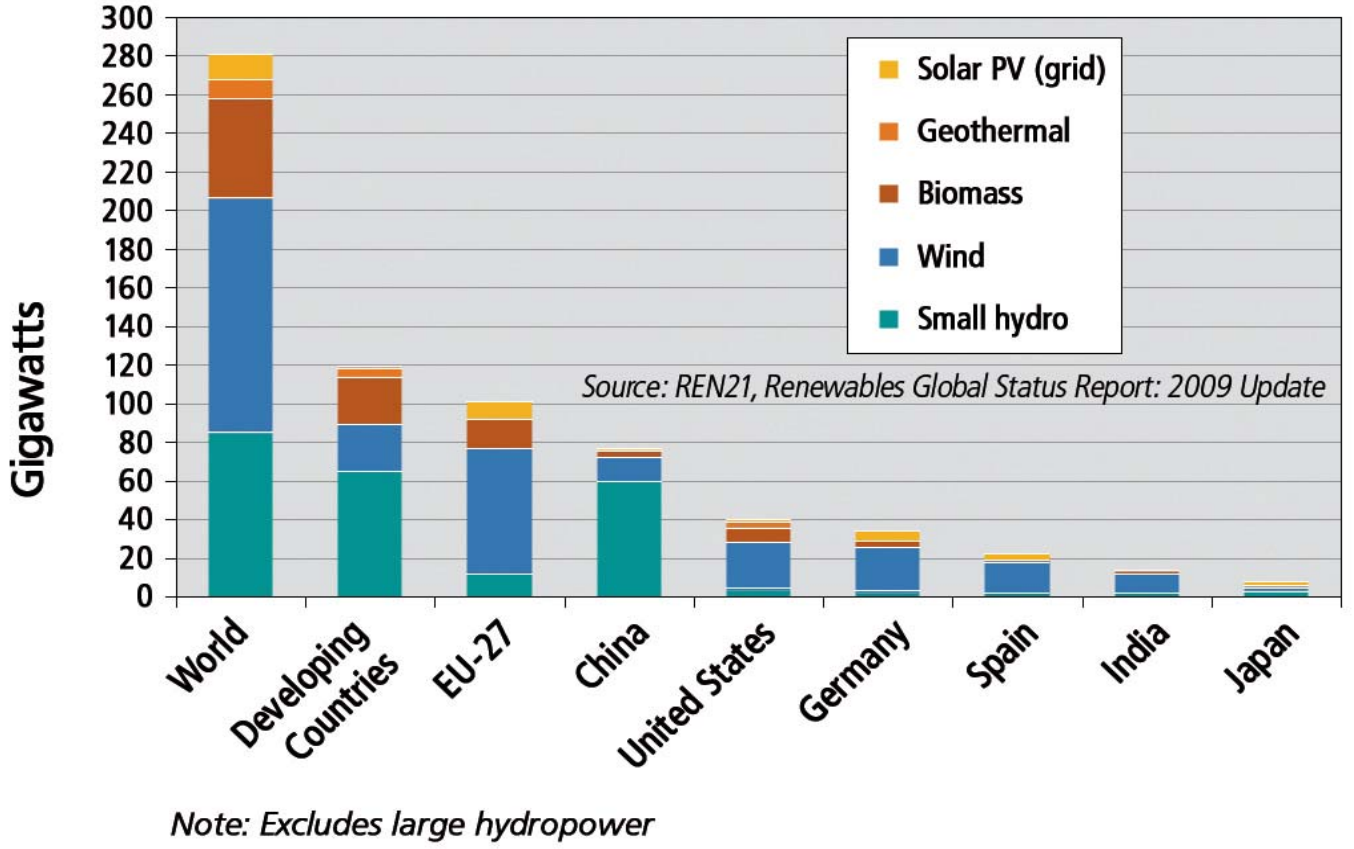
Energy Efficiency in the Southeast

- Efficiency in existing assets
  - Electrical Generation & Transmission
  - Buildings – LEED certification
- Energy Efficiency Standards
- Duke Energy Save-a-Watt program
- Utility programs – Traditional/ non-traditional (Delaware Sustainable Energy Utilities)
- Local municipalities
  - Mayors Climate Protection Agreement
  - City Building ordinances or incentives
- Industry & institutional leadership
  - Manufacturers goal
  - Ray Anderson- Interface Carpets
  - Emory University
  - Office Depot LEED Stores

Combined Heat & Power (CHP) Applications

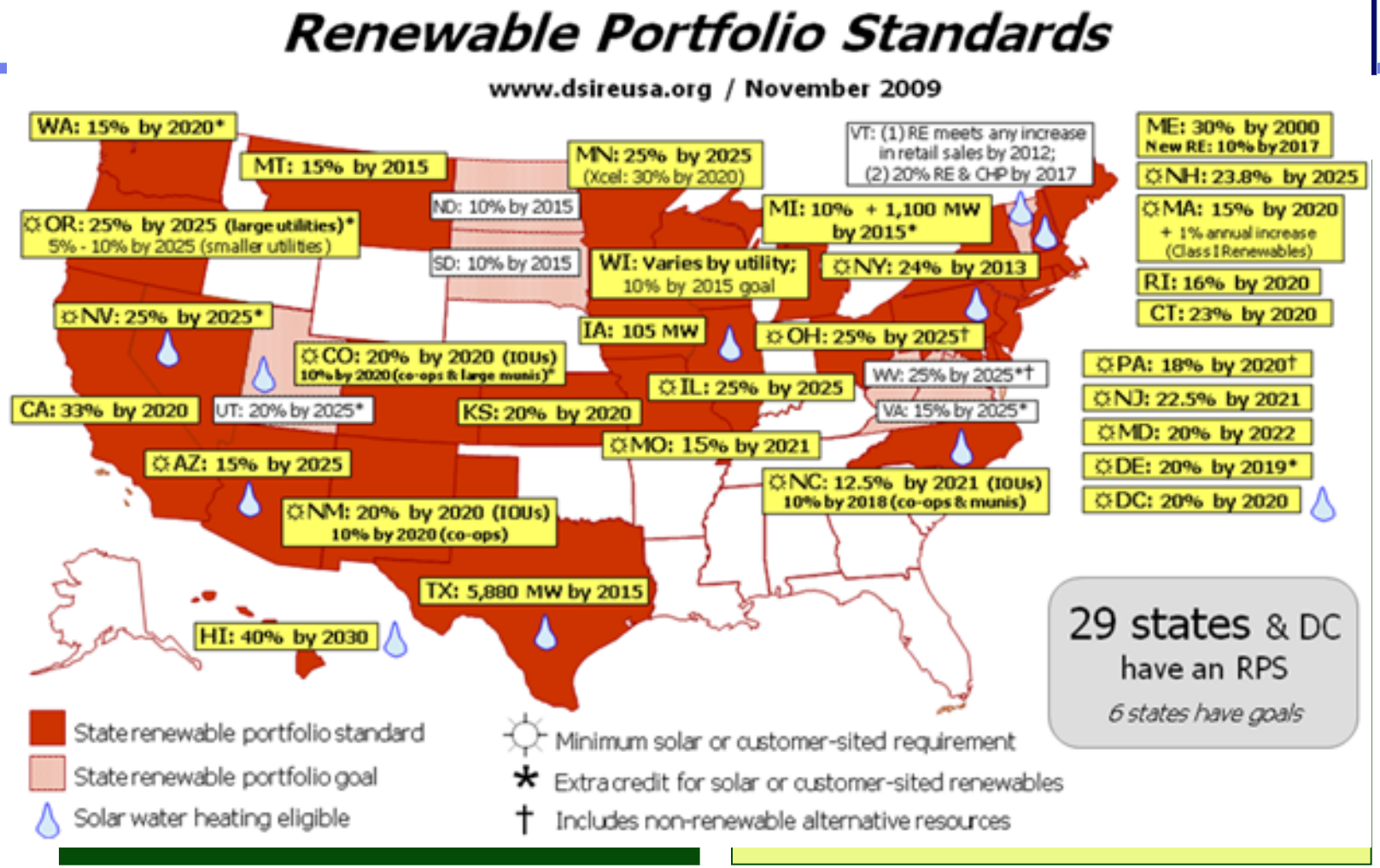
- -CHP role in the national energy supply
  - -85 GW nationwide (9% of US Capacity)
    - -Texas 16.8 GW (7.5 past 10 yrs)
    - -Louisiana 7.0 GW
- -Large CHP Applications
  - -Chemicals, Refining, Pulp and Paper,
  - Food Processing
- -Other opportunities
  - -Data Centers, Utilities, Municipalities
- -Barriers to reaching potential
  - -Few technology improvements needed
    - -Higher efficiency engines & turbines
  - -Low electricity prices and natural gas price volatility
  - -Uncertainty on carbon policy
  - -Credit and financing
  - -Awareness of potential

Figure 4.
Renewable Power Capacities, Developing World, EU and Top Six Countries, 2008



Note: Excludes large hydropower

Renewable Portfolio Standards



ELECTRICITY

The Dash to Gas

Natural Gas is challenging Coal as base load generating option

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

ELECTRICITY

The Dash to Gas

Issues

- Natural gas supply security
- Gas price volatility
- Stress of gas supply and transportation infrastructure
- EPA could limit hydraulic fracturing
- Switch to gas could change transmission flow patterns

ELECTRICITY

Recommendations

- Promote energy efficiency
- Increase renewable energy resources
- Reduce environmental impact of energy consumption and production
- Increase Research and Development of advanced clean energy technologies
- Modernize energy infrastructure
- Expand use of nuclear and CCS for cleaner existing coal generation

*Carbon Capture Component at Mountaineer Plant

Sample Legislative & Regulatory Activities

Senator Graham–Clean Energy Act	- Clean Energy: 25% by 2025, 50% by 2050 - Includes Coal with CCS; nuclear, WTE; Moderate
National Renewable Portfolio Standard	- Minimum 25% by 2025 (Waxman-Markey) -Increased transmission for renewables - Increased price of electricity in some segments of US
EPA Restricts Hydraulic Fracturing	- Limits well location - Increase cost of fluid and cost of water cleanup
Waxman-Markey or similar Cap and Trade Provisions	-Increase value of renewables and energy efficiency -Reduces inefficient or least environmental coal -Increases value of clean-energy alternatives
EPA Regulating GHG Emissions	-Results in pricing carbon emissions
Ash regulated as Hazardous Waste – EPA April 2010	-Initiated by 5 million ton coal ash spill at TVA Kingston Plant (Dec. 2008) -Impact cost of coal handling; use of ash as byproduct
Securities Exchange Commission	-Added climate change risk as reporting requirement

Who's Talking???

- DOE Secretary Chu – *"R&D, regulatory for CCS- Let's build 10 demonstration plants"*
- President Obama- *"Clean coal, nuclear, price on carbon"*
- DOE's Jim Markowski – *"Integrate all resources, rapid expansion of Renewables, Nuclear and Cleaner coal"*

- Bill Gates- *"Miracles Needed in Solving Energy/ Environmental Challenges"*
- WV Governor Manchin- *"RES to fit your state's strength"*
- ARC Fifty Forward- "*Value of Conservation & Alternative Sources"*
- Southface, SEEA, ICLEI, Sustainable Atlanta, ARC Green Communities, Counties

Energy in the South: Reducing Carbon Emissions in Electricity Generation

Gary Garrett

Southern States Energy Board
6325 Amherst Court
Norcross, GA 30092
(770) 242-7712, (770) 242-9956 fax
garrett@sseb.org

www.americanenergysecurity.org
www.sercarbon.org