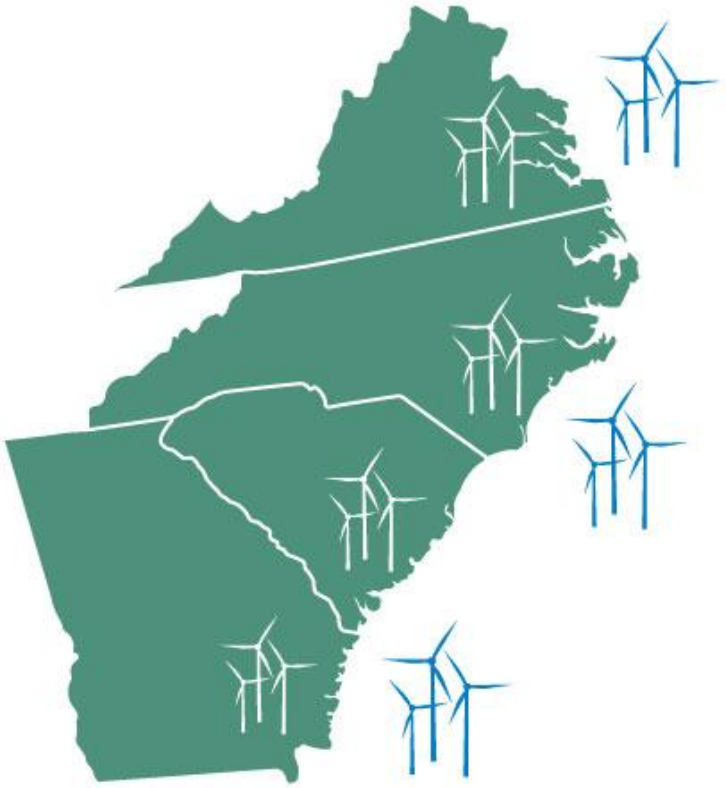
Southeastern Coastal Wind Conference

March 8–9
2012

Charlotte
Convention
Center

Southeast Coastal Wind Conference

What Makes the Southeast Unique



Southeast Market "top ten" list

Virginia

- BOEM Issues Call for Nominations
- Offshore Wind Development Authority Created

North Carolina

- Report of Advisory Panel on Offshore Energy
- Duke Energy Offshore Wind Integration Study
- Nucor - Major Producer of Steel Plate for Turbines

Southeast Market "top ten" list

South Carolina

- $100MM DOE Grant for Drive Train Research
- Palmetto Wind Research Project
- General Electric Turbine Supply Chain Network

Georgia

- ZF Wind Power Gear Box Manufacturing Facility
- Southern Company Offshore Met Tower Lease Application

Panelist

Bruce Bailey, President & CEO

Panelist

Brian O'Hara, *President*

NORTH CAROLINA OFFSHORE WIND COALITION

Panelist

Hamilton Davis, Energy & Climate Director

COASTAL
CONSERVATION
LEAGUE

Panelist

Paul Quinlan, Managing Director

Moderator

Henry Campen, Partner

Attorneys & Counselors at Law

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ALBANY • BARCELONA • BANGALORE

March 2012

ONSHORE & OFFSHORE WIND RESOURCES IN THE SOUTHEAST

BRUCE H. BAILEY

463 NEW KARNER ROAD | ALBANY, NY 12205
awstruepower.com | info@awstruepower.com

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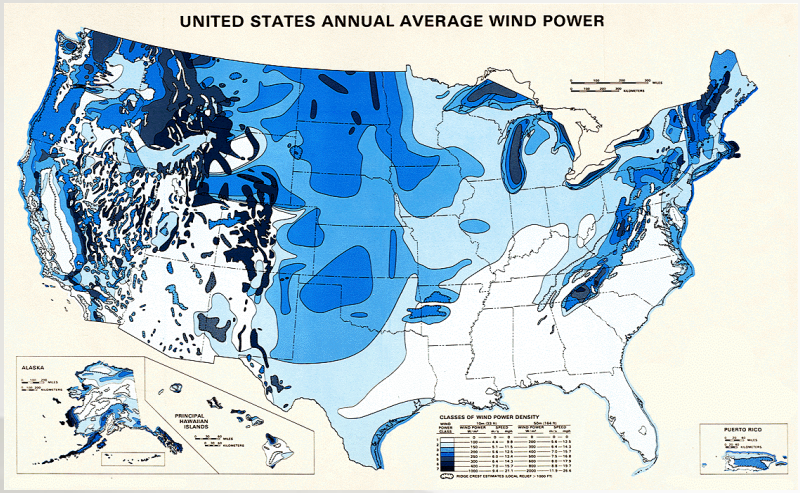
Talk Topics

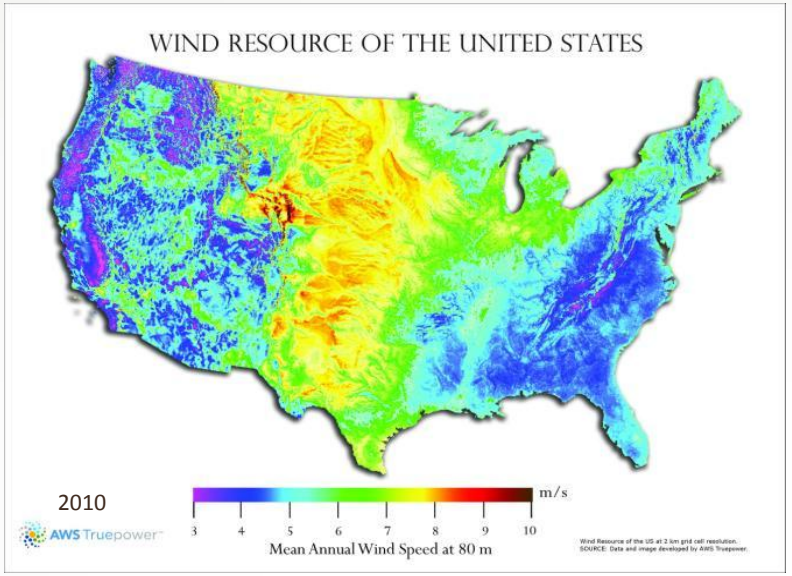
- Wind Resource Availability in the Southeast
- Water Depth and Wind Resource Availability
- Capacity Factors & Turbine Technology Advances
- Diurnal Winds and Load Coincidence
- Hurricane Risks
- Conclusions

Relative Resource Availability

- Historically the Southeast has been written off as a ‘no wind’ zone
- Few tall tower wind measurements; little wind plant experience
- Winds on low lying land average light to moderate (Class 1-2), with strongest winds (Class 3-4) on interior ridges & summits
- Offshore winds are sharply stronger (Class 4-6)



Circa 1983



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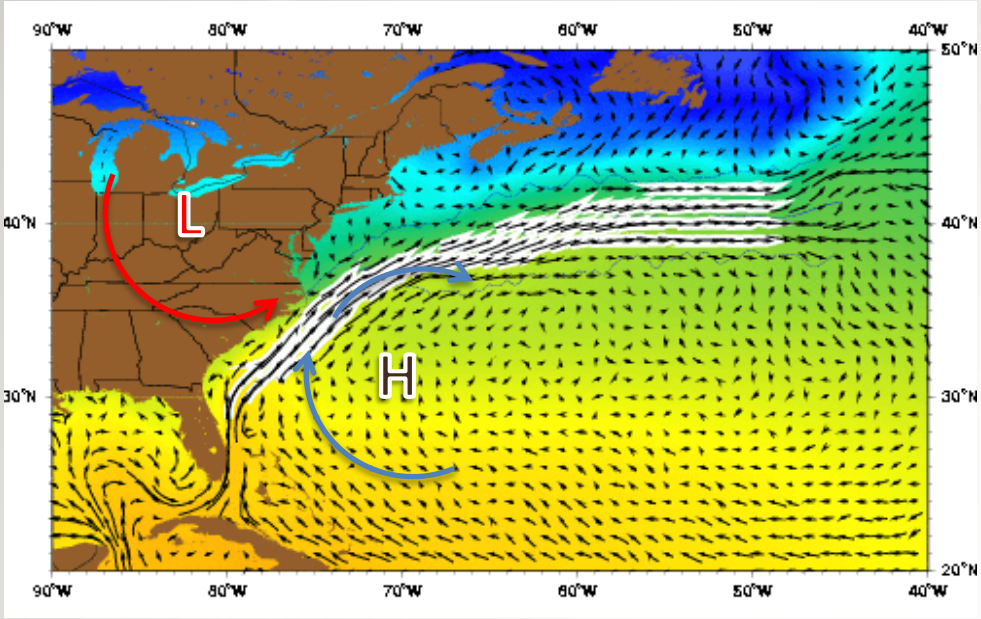
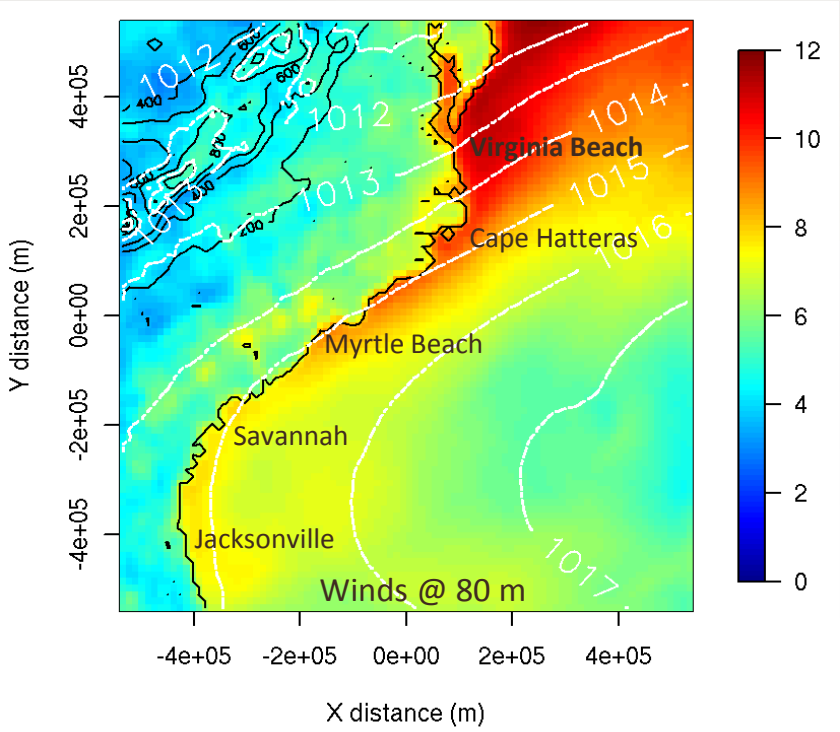
The Southeast's Meteorological Regime

Typical Ocean Currents and Atmospheric Pressure Patterns



Frequent Summer Flow Regime with Bermuda High and Lee Trough East of Appalachians



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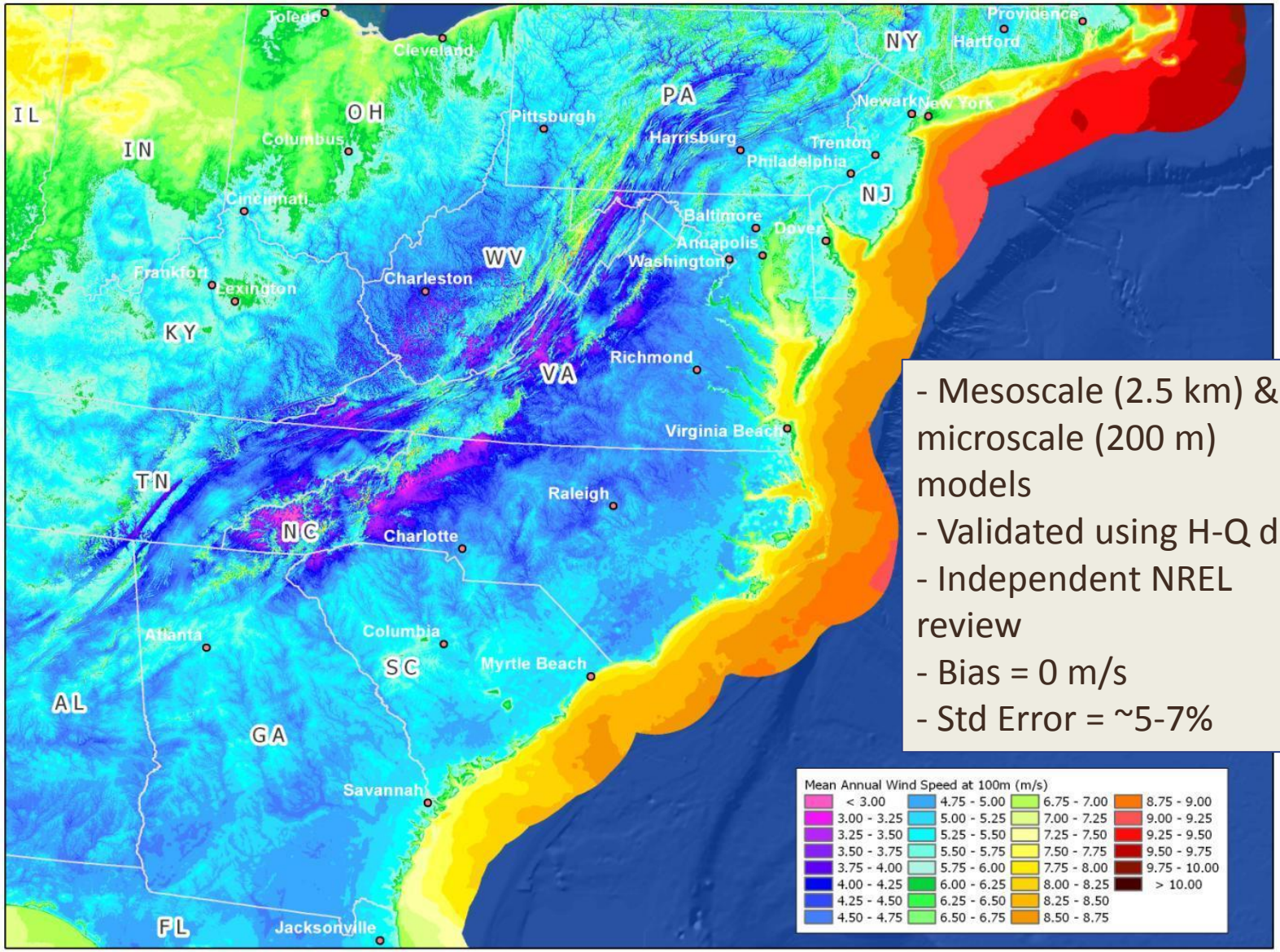
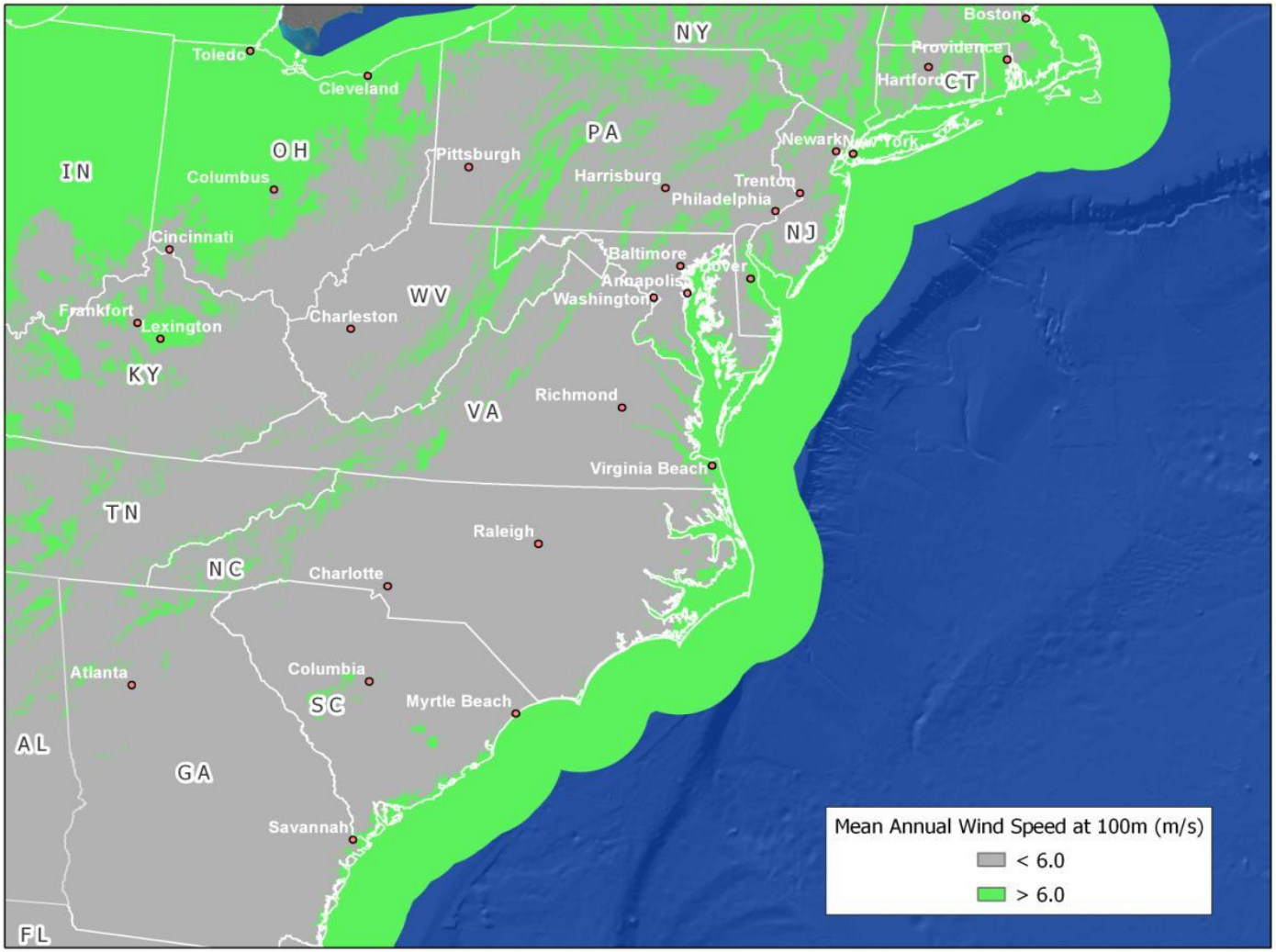
Annual Avg. Wind Speed Map @ 100 m



Regions with Avg Speeds >6 m/s @ 100 m



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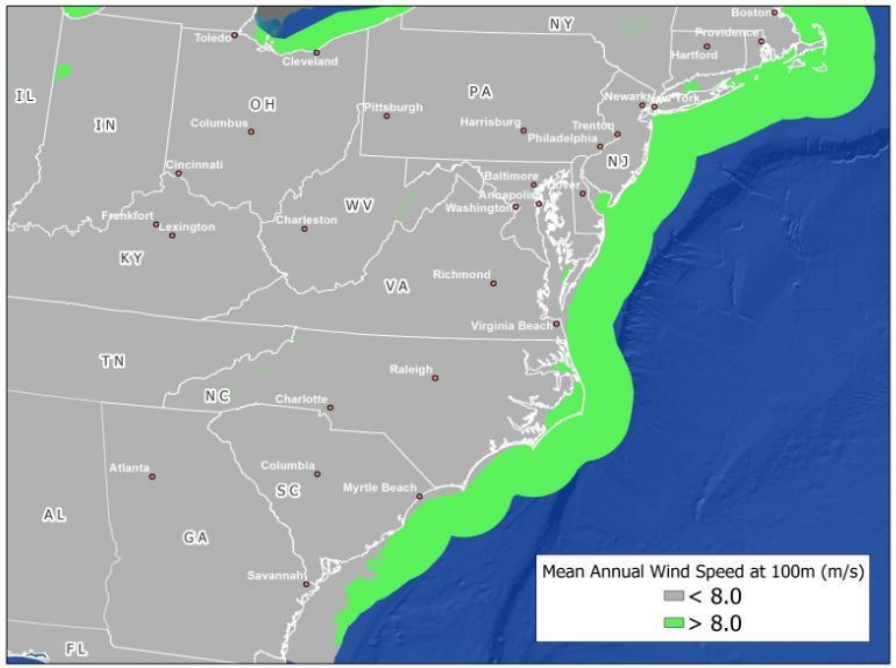
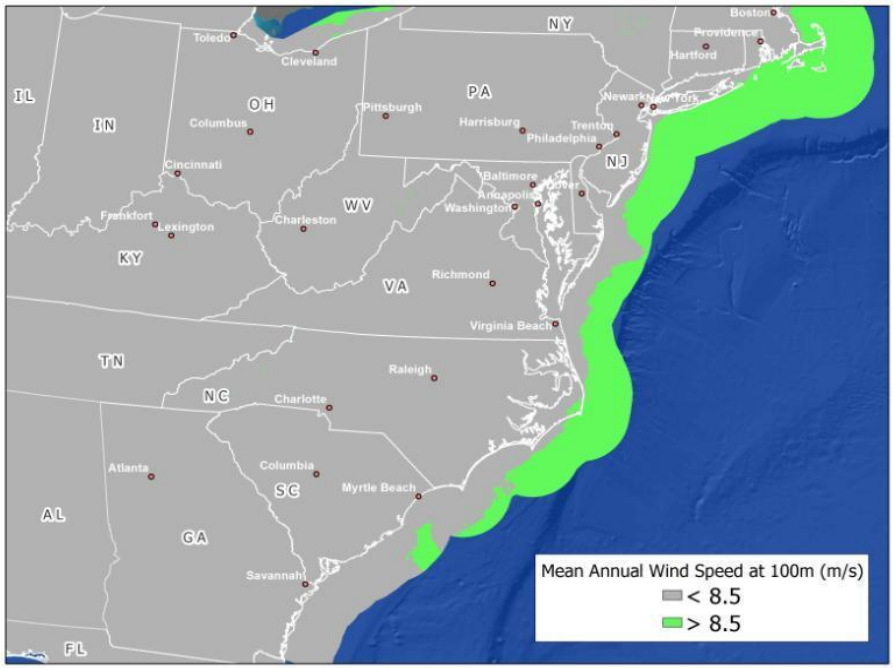
Regions with Avg Speeds > 8 m/s and 8.5 m/s





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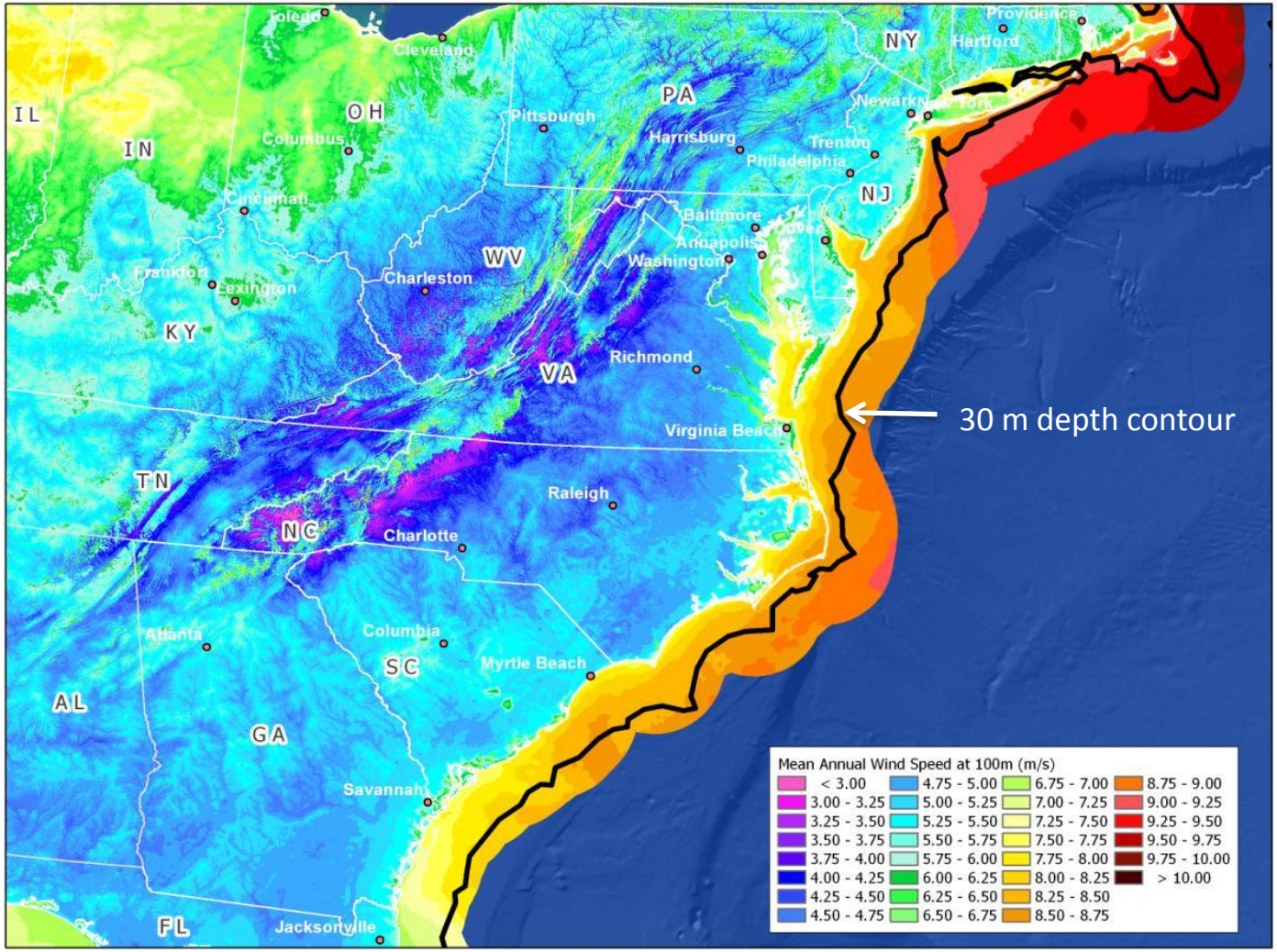
Water Depth and Resource Availability



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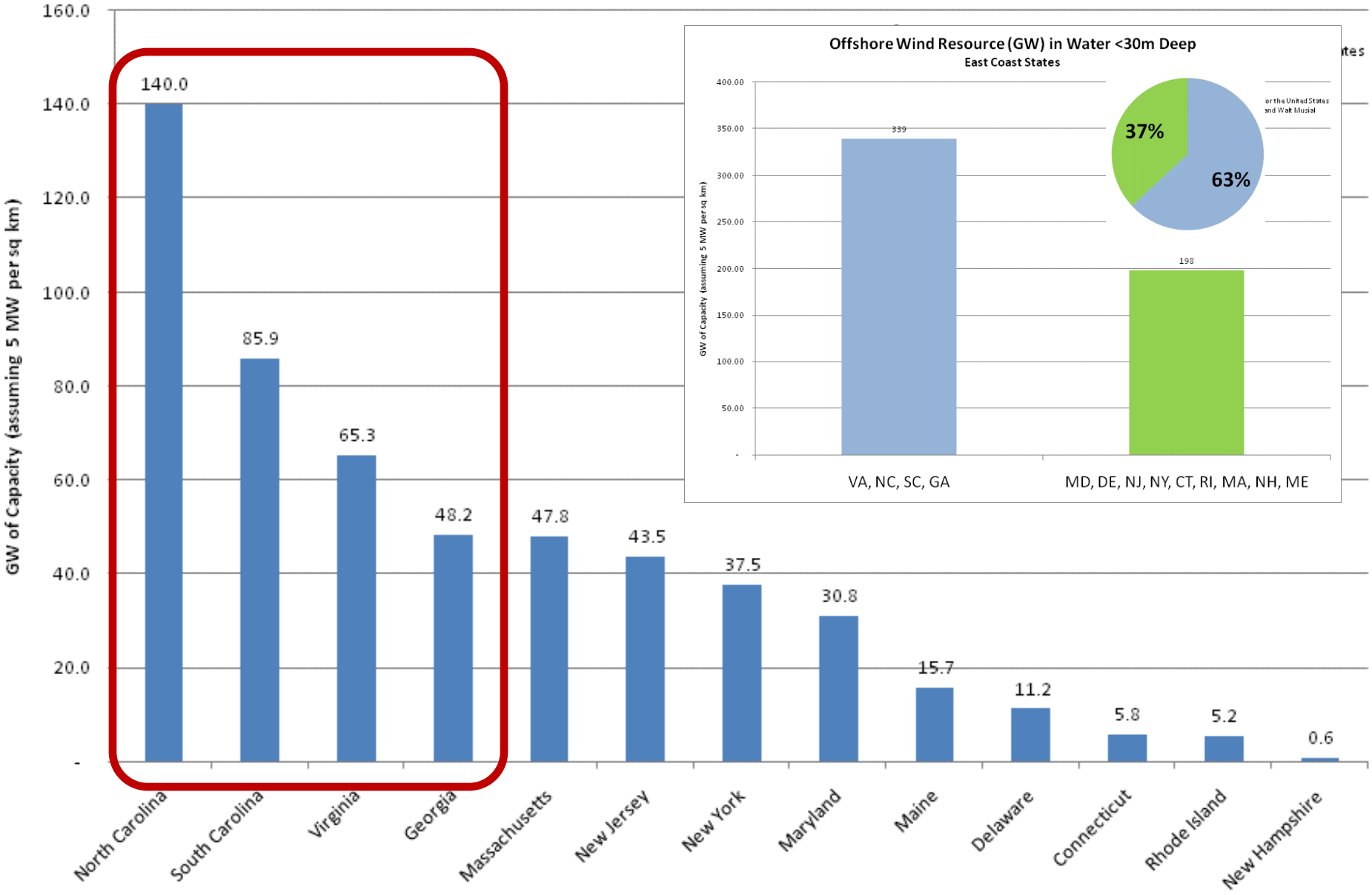
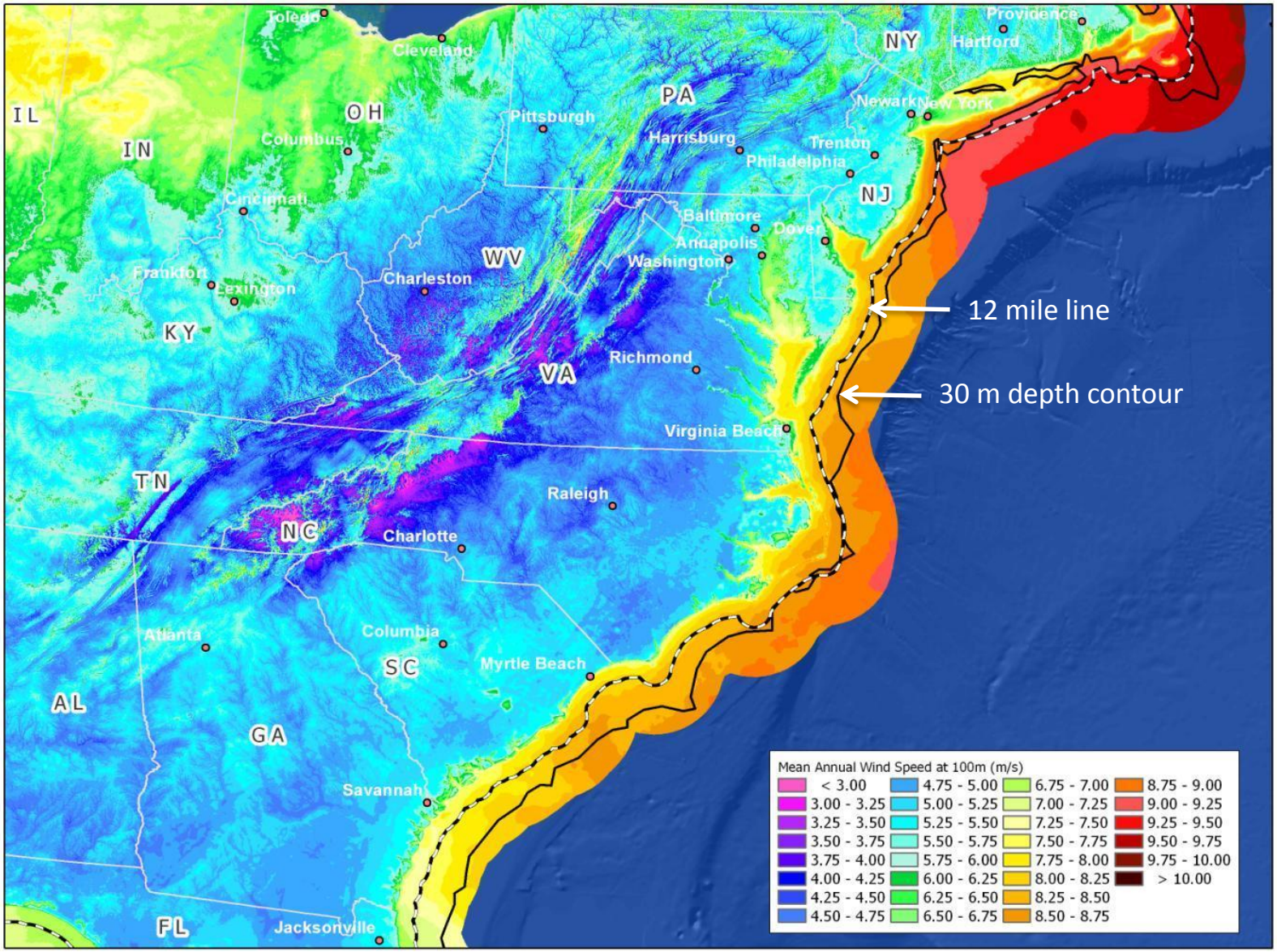
Offshore Wind Resource (GW) in Water <30m Deep

East Coast States

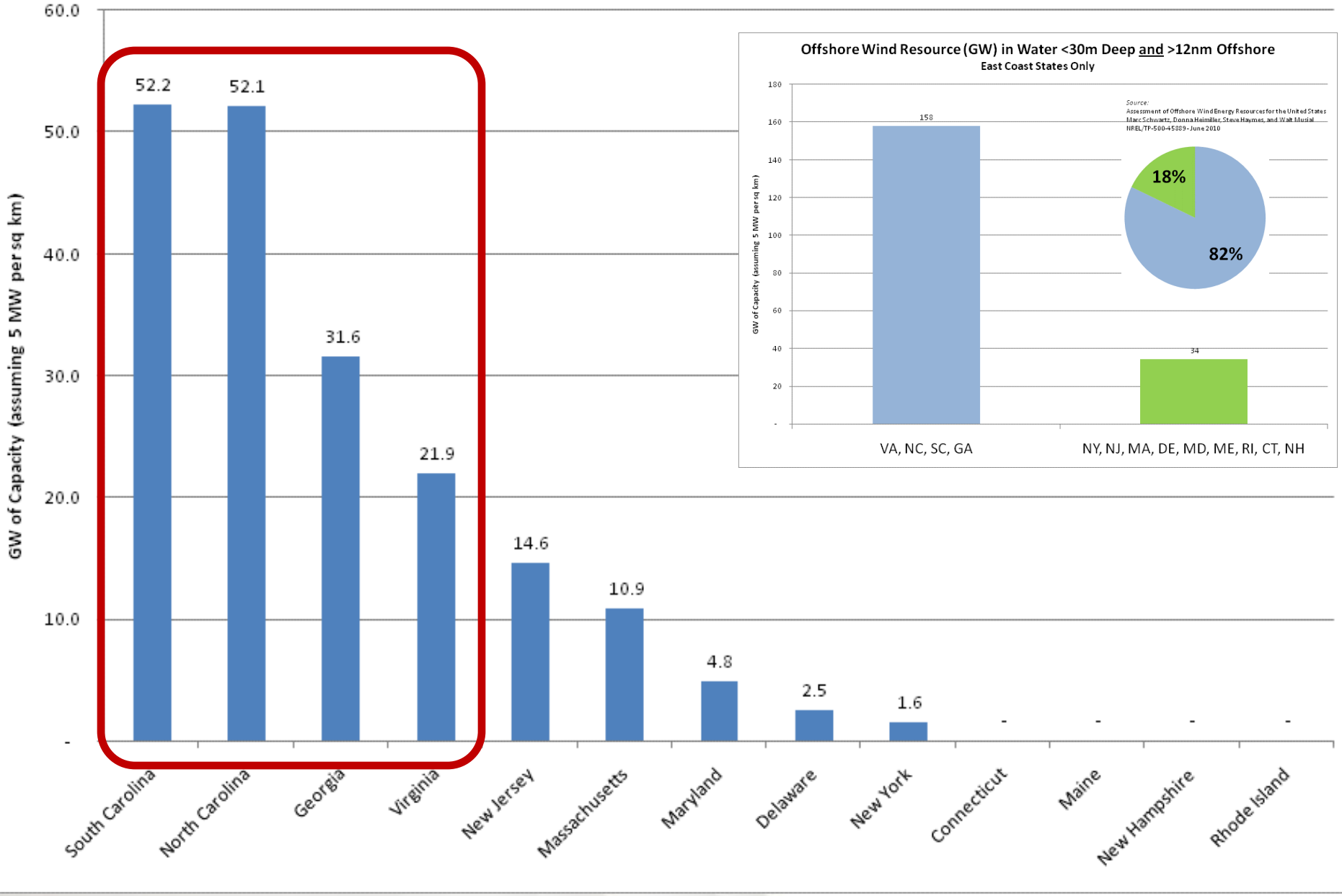


Water Depth and Distance From Shore

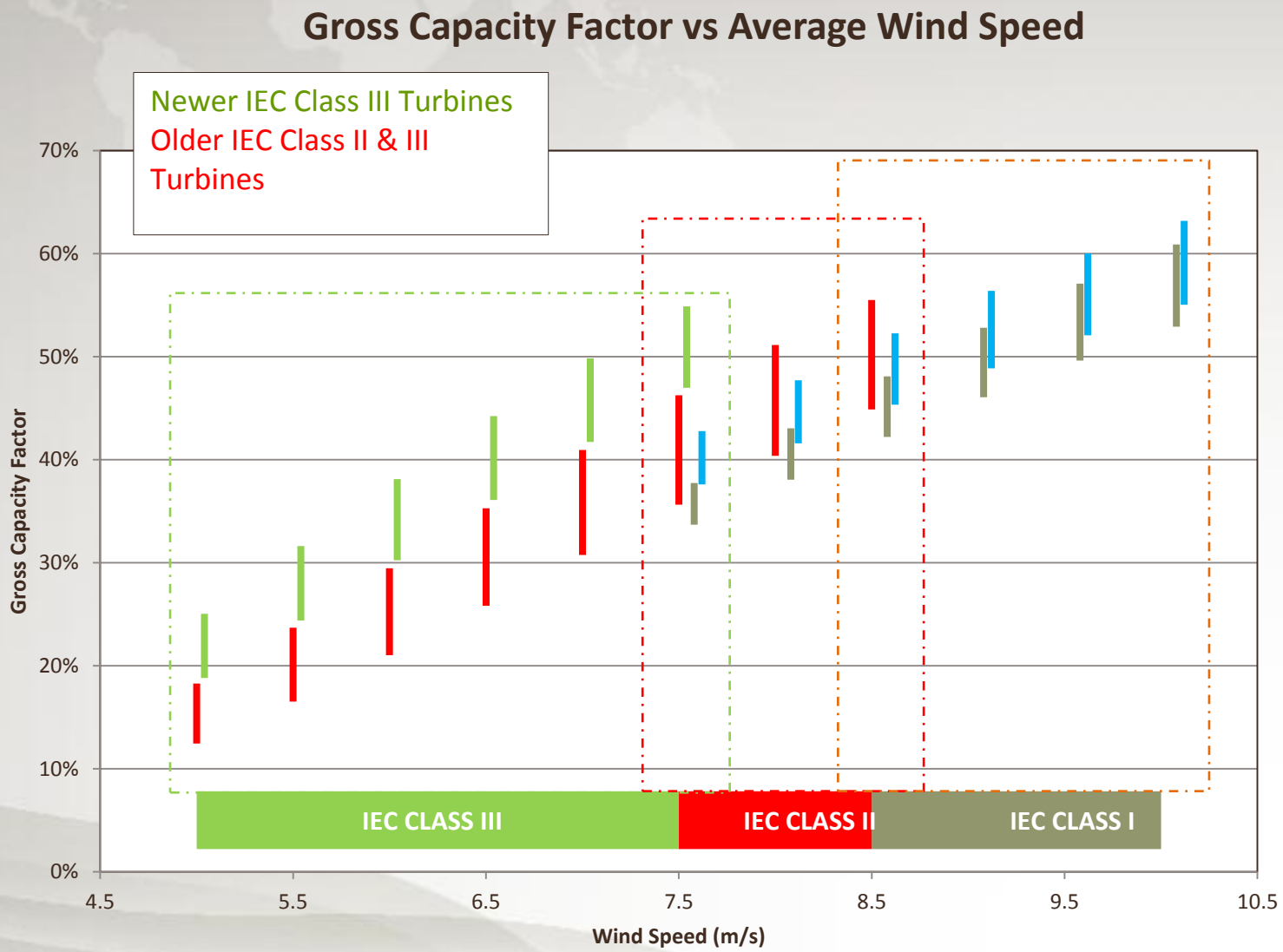


Offshore Wind Resource (GW) in Water <30m Deep and >12nm Offshore

East Coast States Only



Turbine Technology Performance Trends



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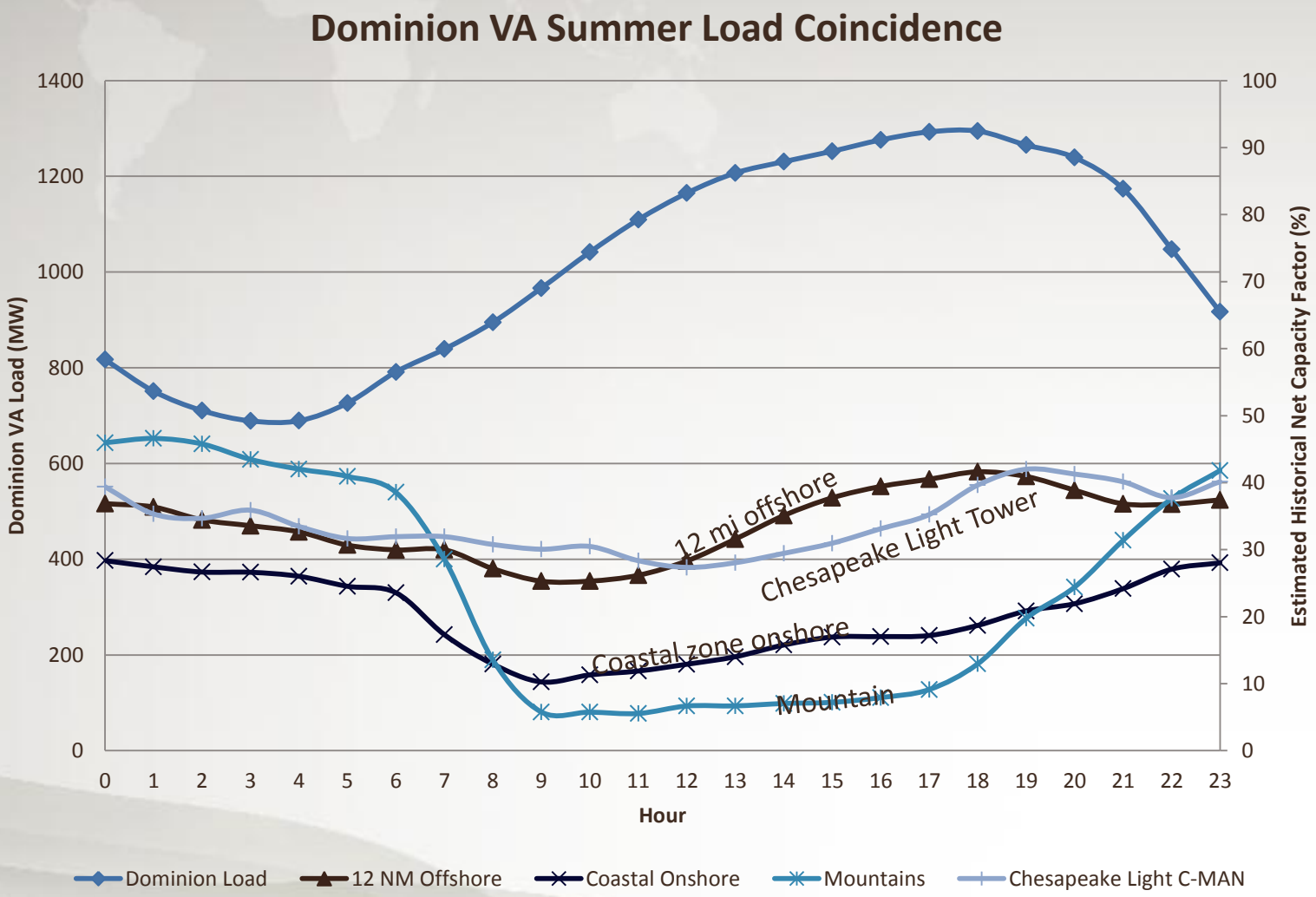
Load Matching Quality of the Resource

- Offshore wind has a stronger diurnal coincidence with load than onshore wind, having production peaks in the late afternoon and early evening.
- Coincidence of offshore wind and load is typically most defined in summer months, when loads in the Southeast peak.
- Stronger coincidence is beneficial to grid operators, as they will receive the energy when they need to support load.
- Stronger coincidence is beneficial to developers, as they will generate energy when power prices are at a peak.

Load Coincidence Illustration - Virginia



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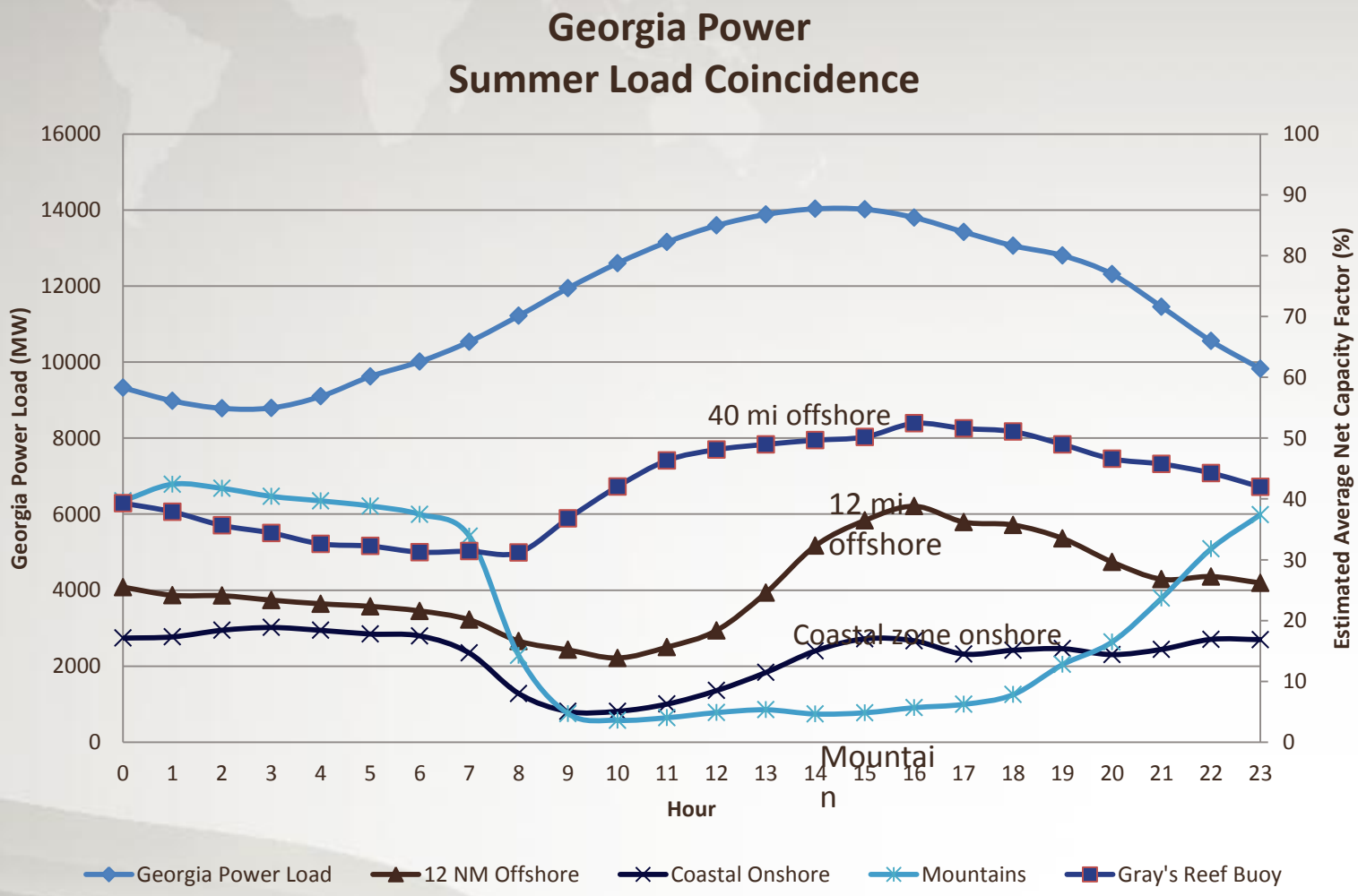
Load Coincidence Illustration - Georgia



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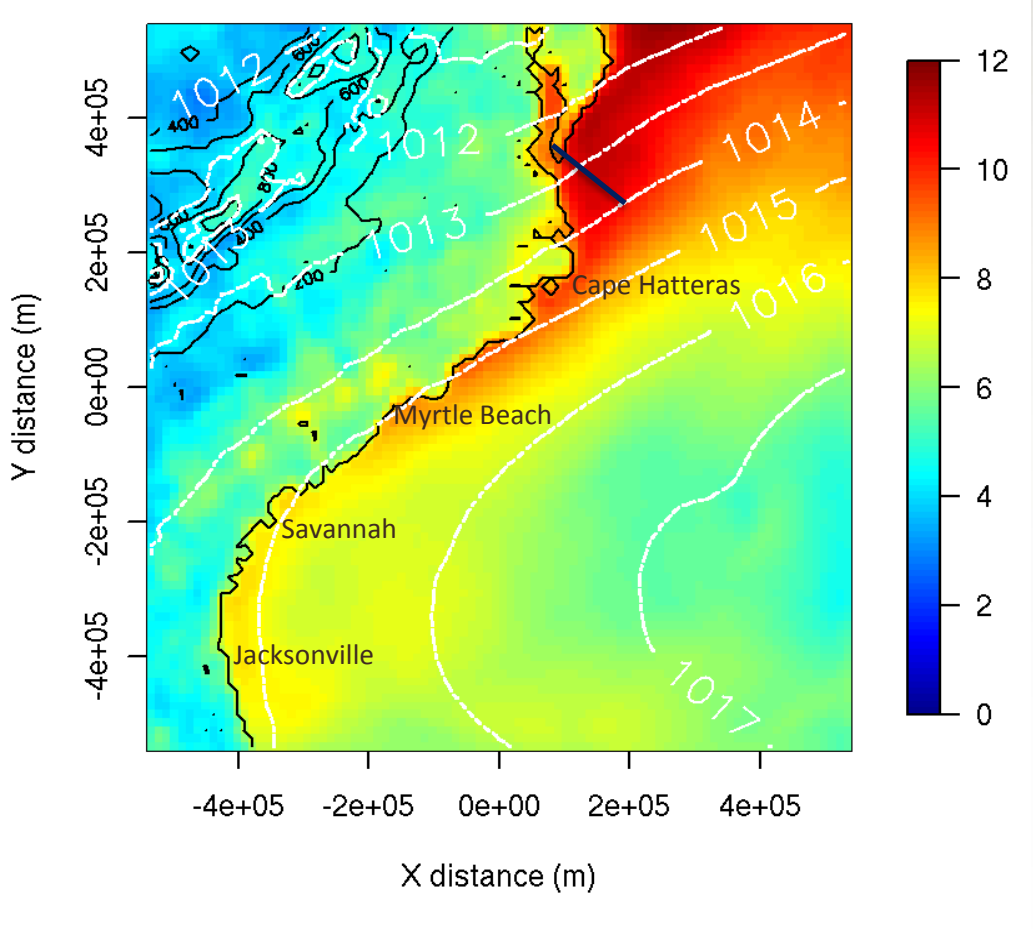
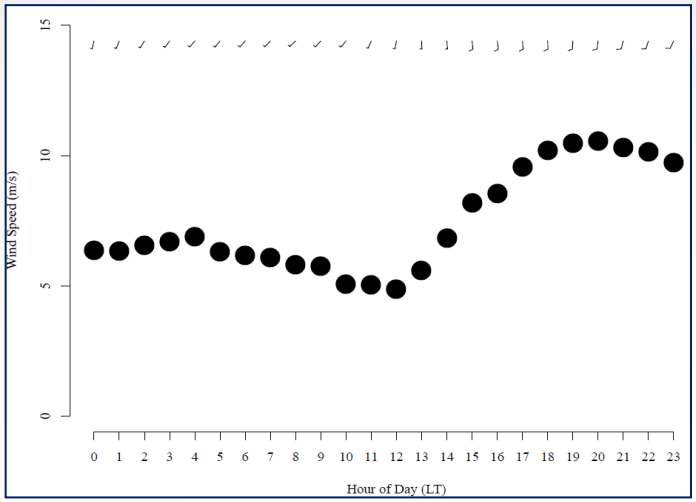
Flow Regimes and Load Coincidence



Avg Diurnal Wind Speeds at Chesapeake Light Tower During Summer Enhanced Flow Regimes



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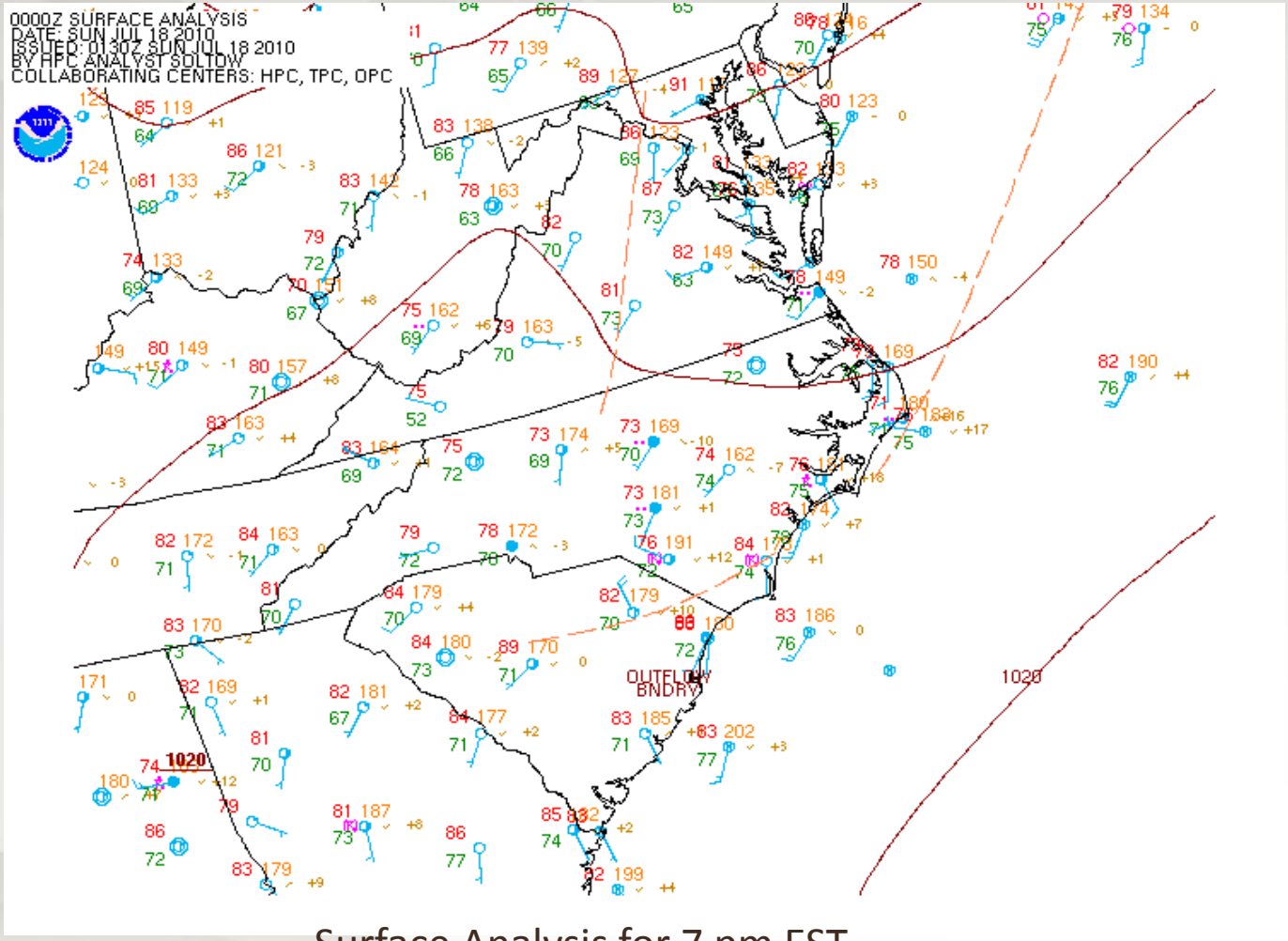
Case Study – July 17-18, 2010



Surface Analysis for 7 pm EST 7/17/2010

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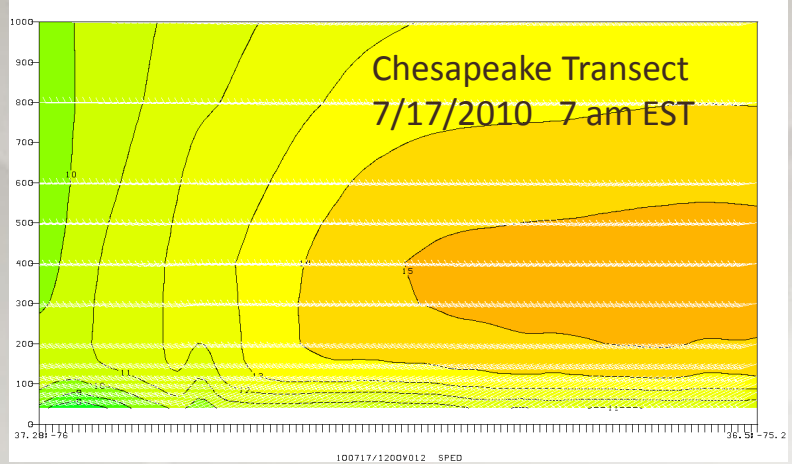
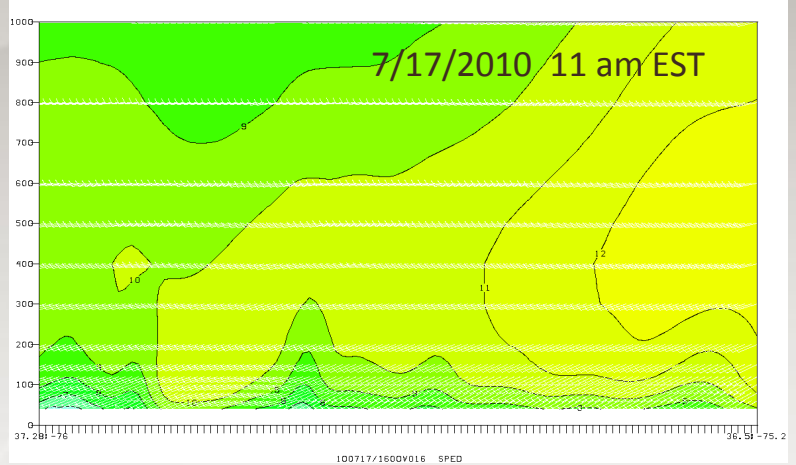
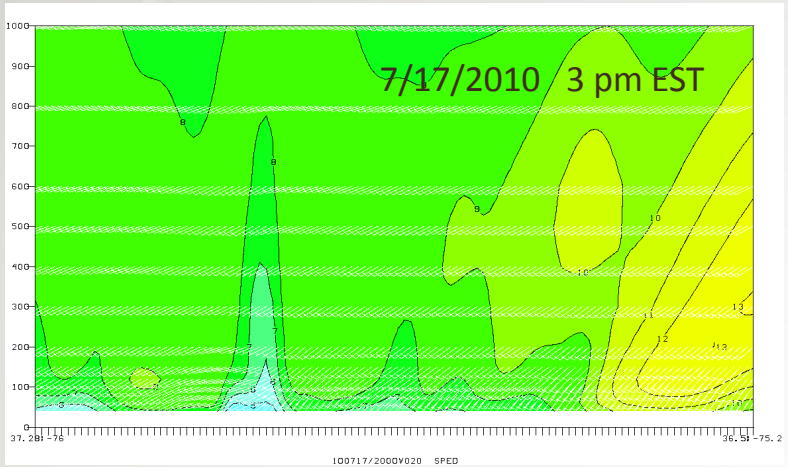
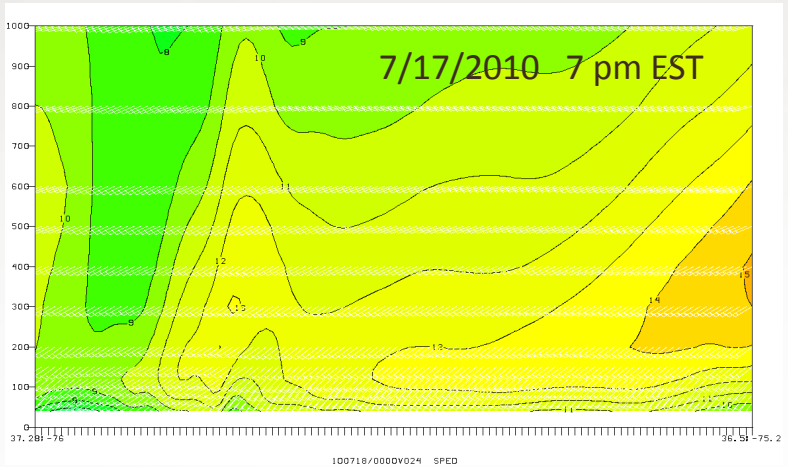
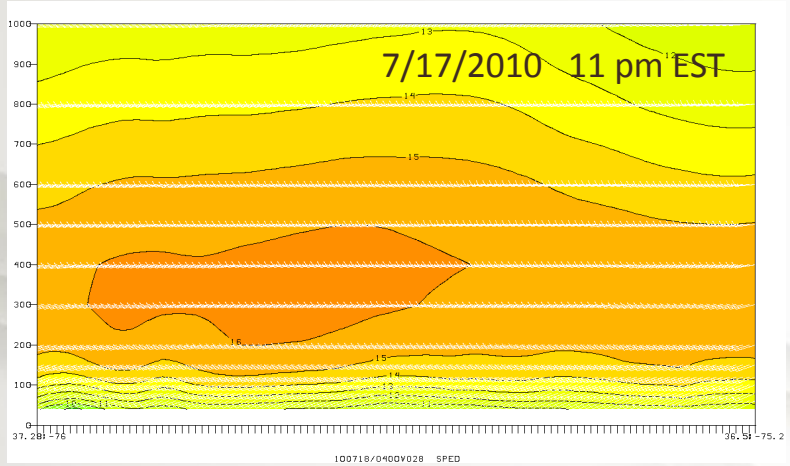
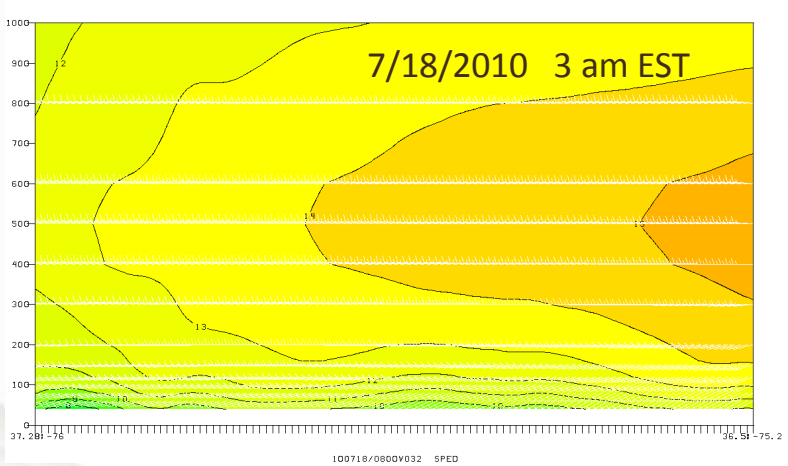

Chesapeake Transect
7/17/2010 7 am EST


7/17/2010 11 am EST


7/17/2010 3 pm EST


7/17/2010 7 pm EST


7/17/2010 11 pm EST


7/18/2010 3 am EST

Hurricanes: Saffir – Simpson Scale

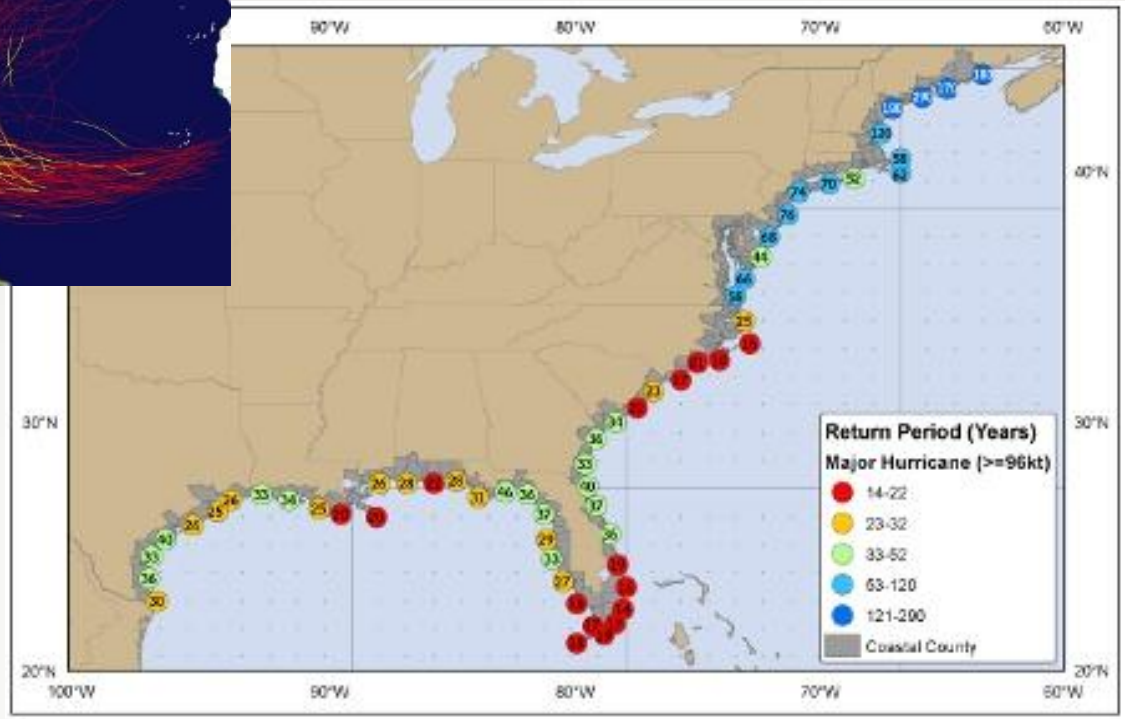
Category	Winds	Damage Summary
1	73-95 mph 33-42 m/s	Some
2	96-110 mph 43-49 m/s	Extensive
3	111-129 mph 50-58 m/s	Devastating
4	130-156 mph 58-70 m/s	Catastrophic
5	157 mph + 70 m/s +	Catastrophic

Clarifications

- Speeds are peak 1-min values @ 10 m
- Scale does not address potential for storm surge and tornadoes
- Extreme 3-sec speed w/50 yr recurrence by turbine IEC Class:
  - **I**: 70 m/s @ hub height
  - **II**: 59.5 m/s
  - **III**: 52.5 m/s
- 1-min $\Rightarrow$ 3-sec adjustment $\cong$ 1.19
- 10 m $\Rightarrow$ 100 m adjustment $\cong$ 1.10
- Nor'easters can have Category 1 -2 qualities (winds and flooding)

Risks of Major Hurricanes

Major hurricanes
Category 3+; ≥50 m/s @ 10 m



Estimated return period in years for major hurricanes passing within 50 n-mi of locations on the US Coast (National Hurricane Center)

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Summary & Conclusions

- The Southeast's wind resources are relevant, dynamic, and complex.
- Turbine technology trends are creating a larger market in the SE.
- The Southeast has more shallow water potential than the MA & N.
- Offshore winds have better load coincidence than on land.
- Winds in this region are less understood than other regions, with higher uncertainties for speed/energy projections.
- New measurement programs are the best way to improve our understanding of boundary layer dynamics (shear, stability, stratification, low level jets) and commensurate ocean conditions.
- The industry relies strongly on atmospheric modeling tools, which will benefit greatly from the availability of new data.

Thank You

bbailey@awstruepower.com

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Unique Market Metrics of the Southeast

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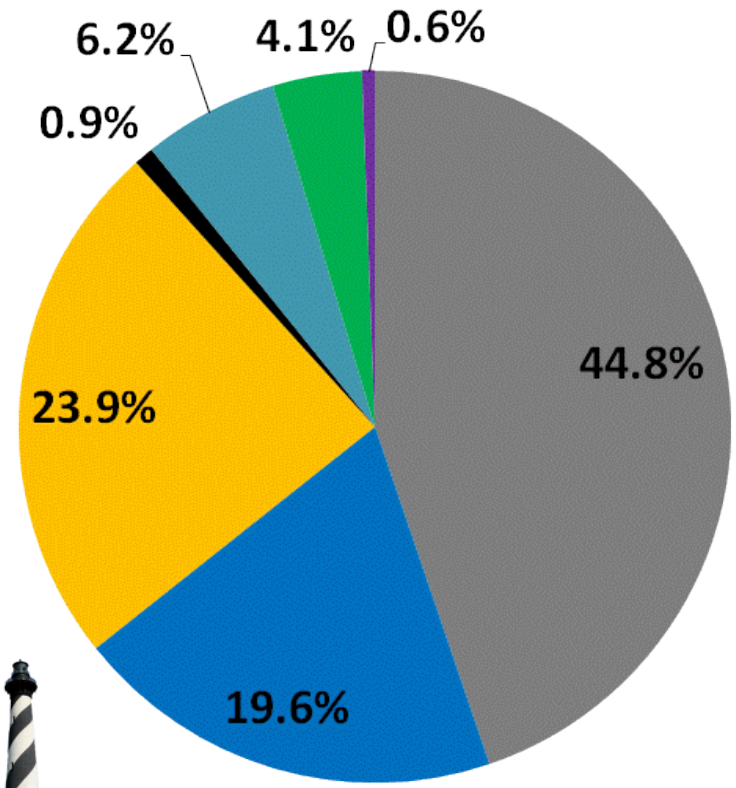
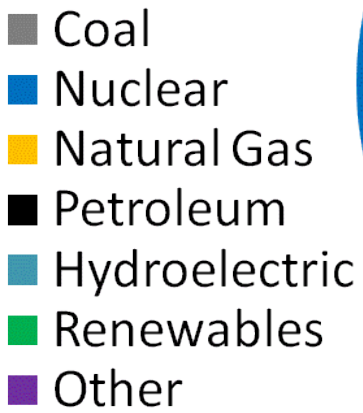
Brian O'Hara, NC Offshore Wind Coalition

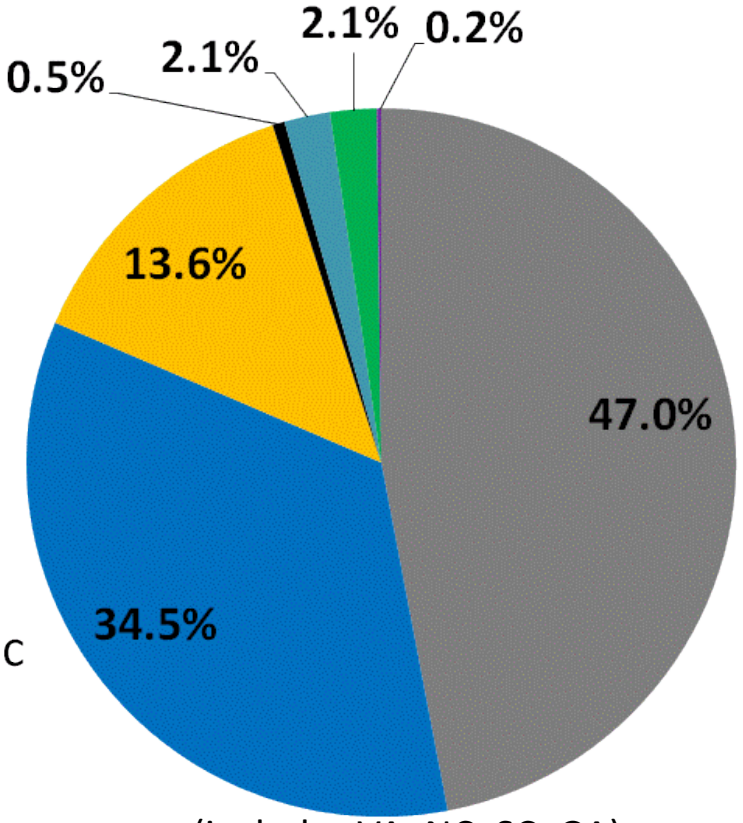
Electricity Generation Sources

U.S. Total





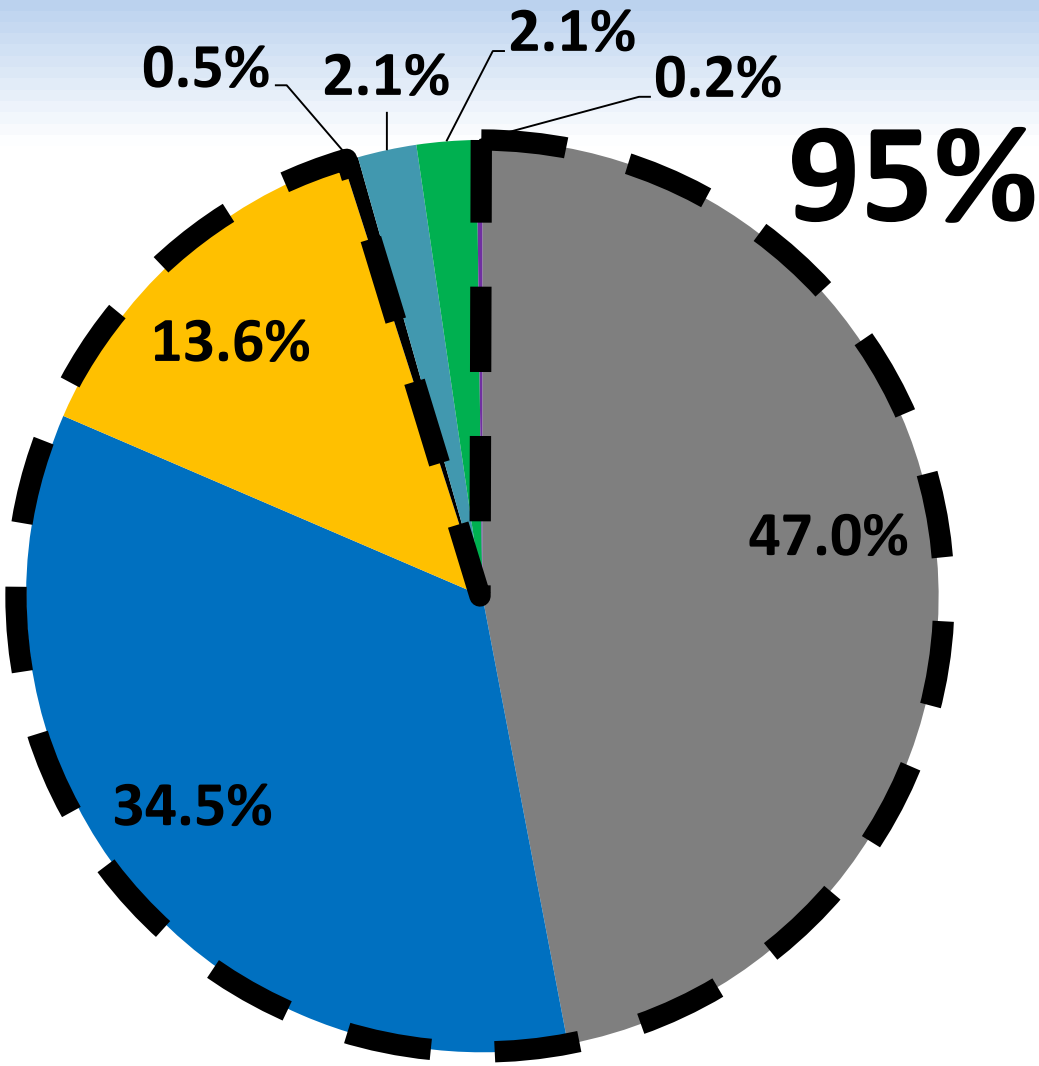
Southeast



(includes VA, NC, SC, GA)

Source: US Energy Information Administration, 2010 data

Southeast Electricity Sources



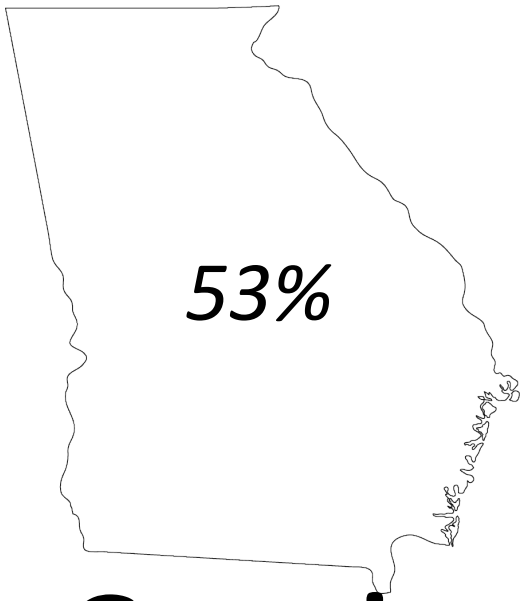
Almost all fuel is **imported**

- Coal
- Nuclear
- Natural Gas
- Petroleum
- Hydroelectric
- Renewables
- Other

Source: US Energy Information Administration, 2010 data, includes VA, NC, SC, GA

Largest Coal Importers in the U.S.?

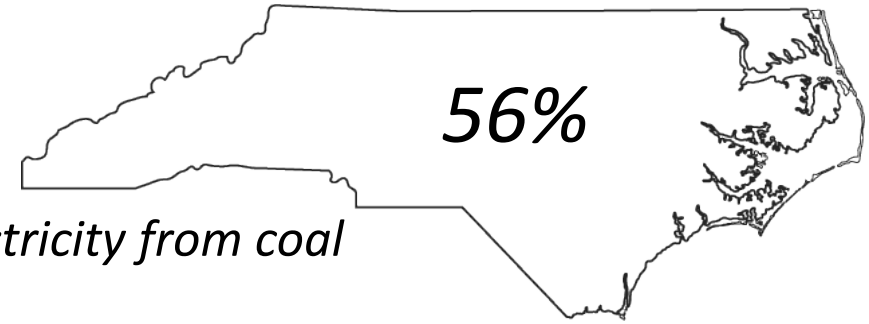
#1



Georgia
$2.6 billion

% of electricity from coal

#2



North Carolina
$2.3 billion

Source: Union of Concerned Scientists, using 2008 data

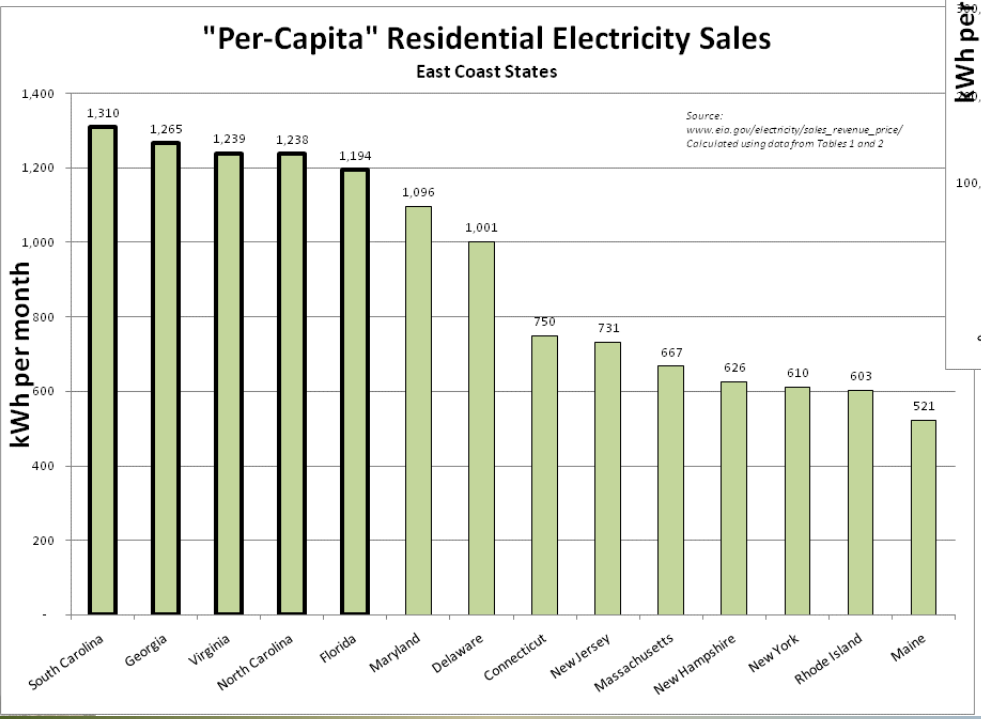
Market Size

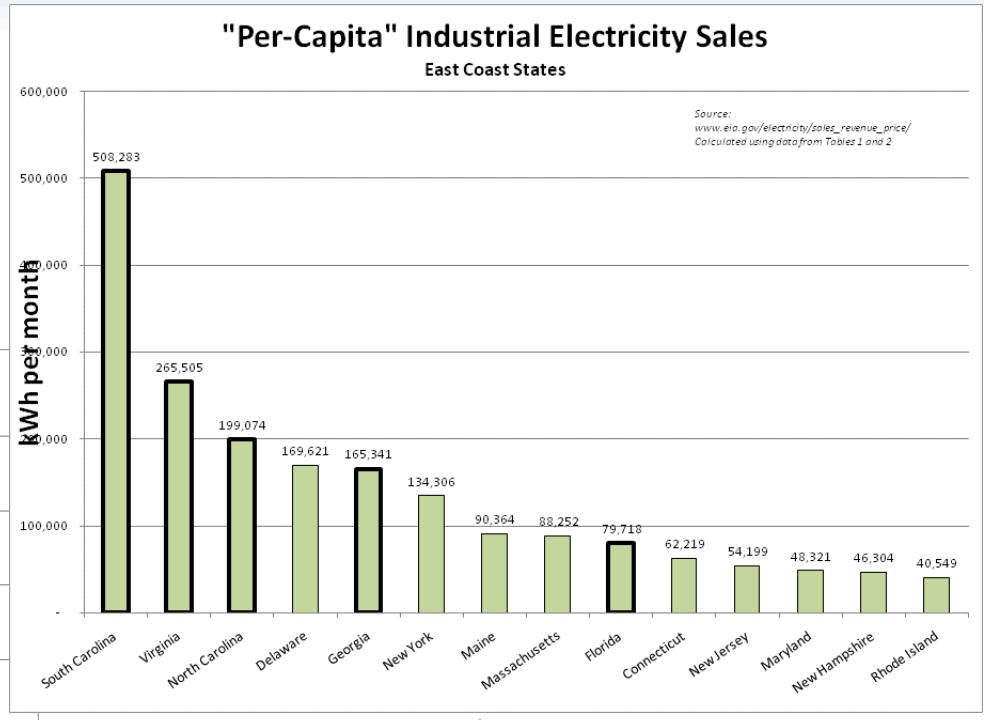
We use a lot
of electricity down here

High “Per Capita” Electricity Use

Residential

(top 5)



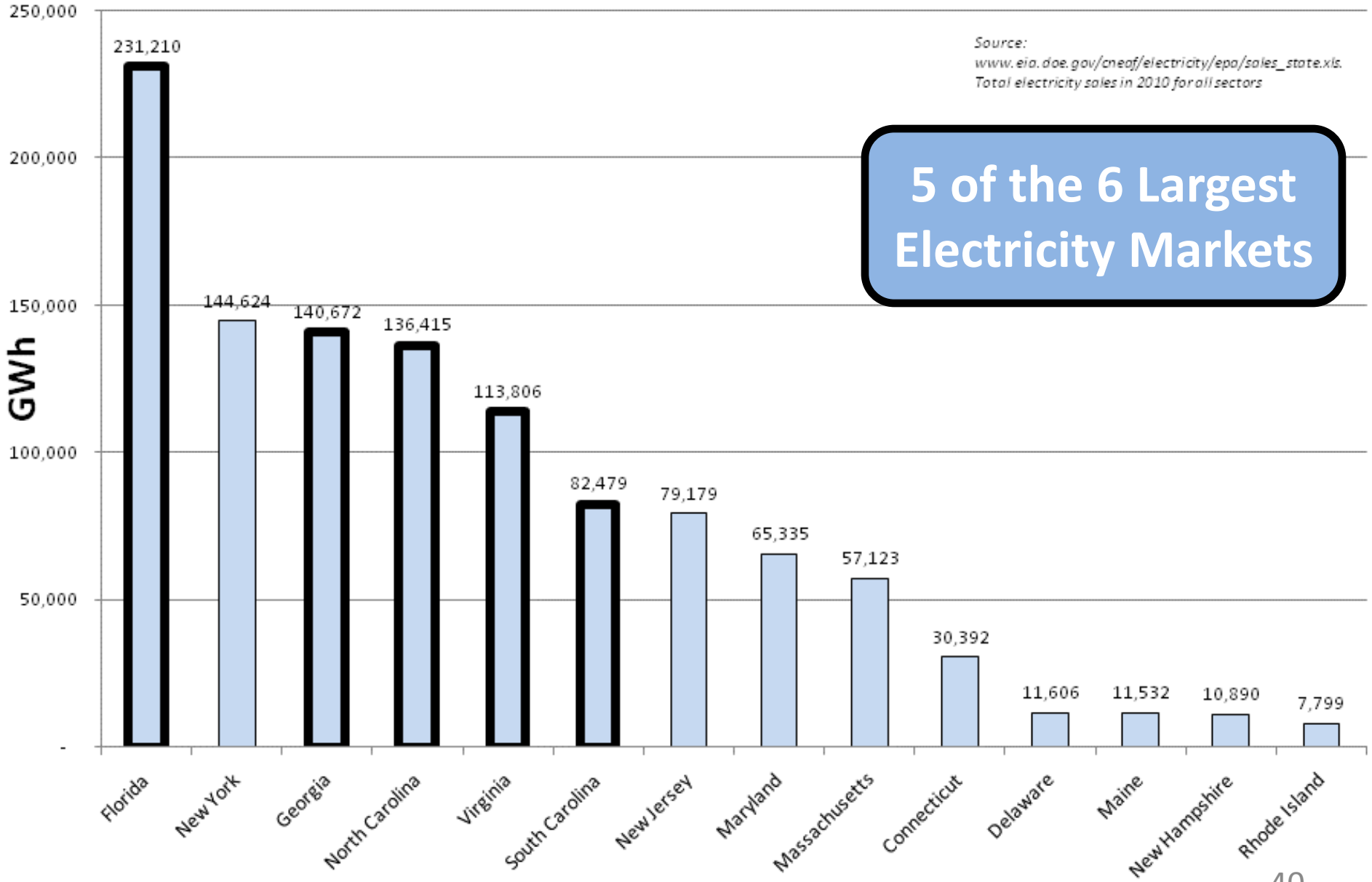


Industrial

(4 of top 5)

2010 Electricity Sales

East Coast States

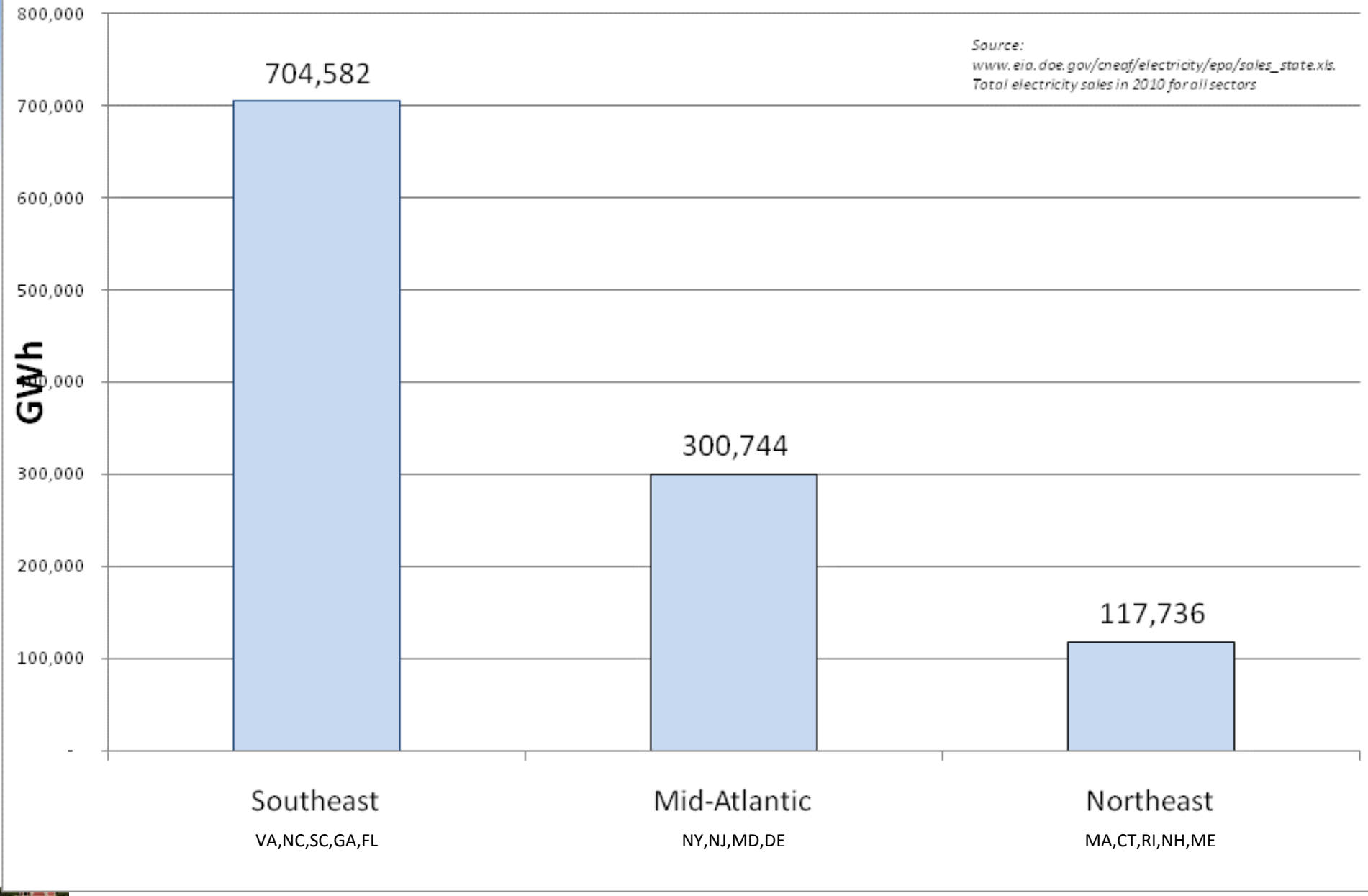


Source:
www.eia.doe.gov/cneaf/electricity/epa/sales_state.xls.
Total electricity sales in 2010 for all sectors

5 of the 6 Largest Electricity Markets

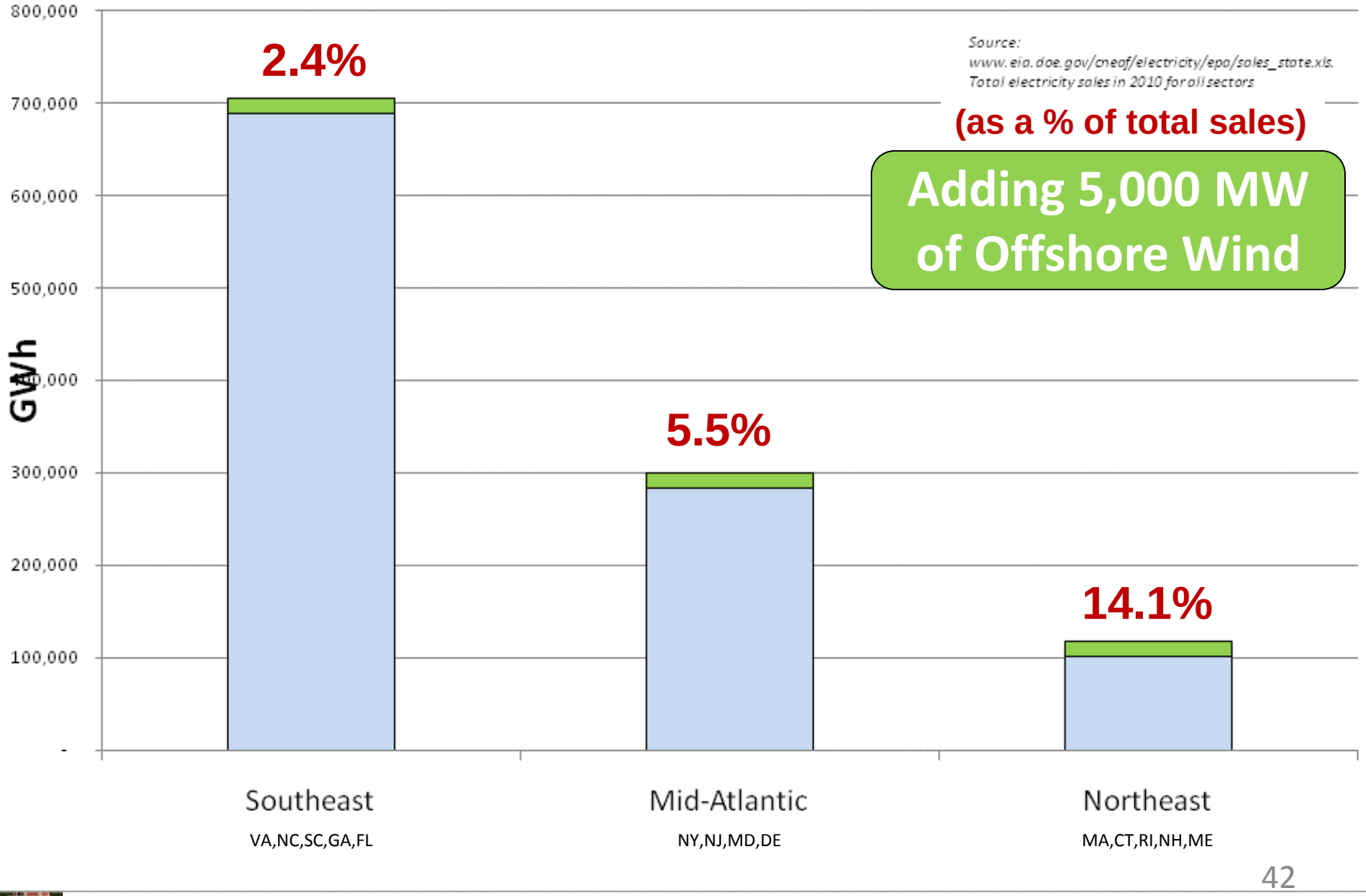
2010 Electricity Sales

East Coast States



2010 Electricity Sales

East Coast States



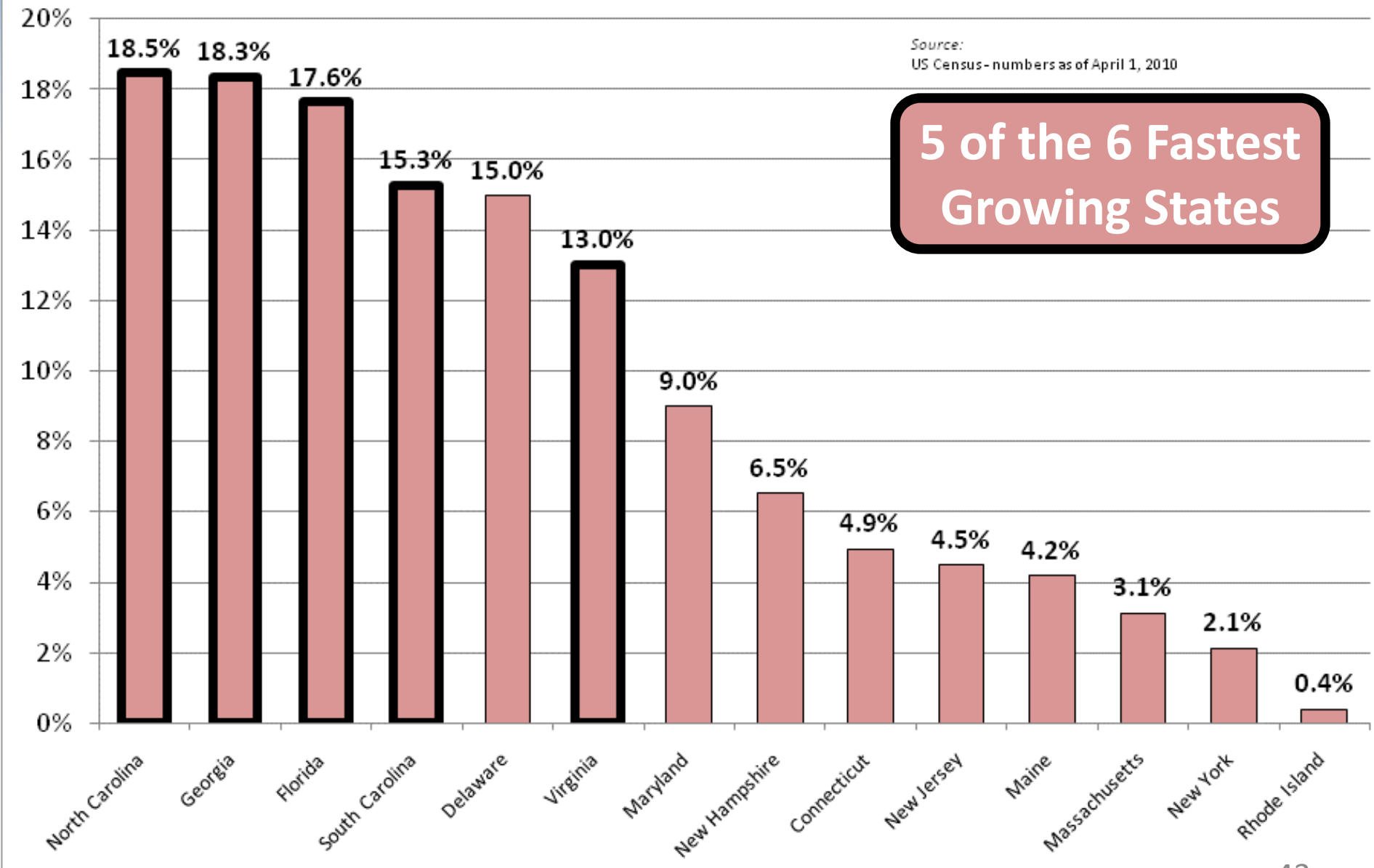
Source:
www.eia.doe.gov/cneaf/electricity/epa/sales_state.xls.
Total electricity sales in 2010 for all sectors

(as a % of total sales)

Adding 5,000 MW of Offshore Wind

Population Growth Rate

East Coast States - 2000 to 2010



Military Bases in the Southeast

Army

1. Chopawamsic Training Center (VA)
2. Fort A.P. Hill (VA)
3. Fort Belvoir (VA)
4. Fort Eustis (VA)
5. Fort Lee (VA)
6. Fort Myer (VA)
7. Fort Pickett (VA)
8. Fort Story (VA)
9. Front Royal Quartermaster Depot (VA)
10. Radford Army Ammunition Plant (VA)
11. Camp Butner (ARNG) (NC)
12. Camp Davis (NC)
13. Camp Mackall (NC)
14. Fort Bragg (NC)
15. Pope Army Airfield (NC)
16. Camp Croft (SC)
17. Fort Jackson (SC)
18. Fort Benning (GA)
19. Fort Gordon (GA)
20. Camp Merrill (GA)
21. Fort Stewart (GA)
22. Hunter Army Airfield (GA)
23. Camp Blanding (FL)
24. Daytona Beach WAC Training Center (FL)

Navy

25. Chesapeake NSGA (VA)
26. NSWCDD (VA)
27. Training Support Center Hampton Roads (VA)
28. NAB Little Creek (VA)
29. NS Norfolk (VA)
30. NAS Oceana (VA)
31. Wallops Island ASCS (VA)
32. NWS Yorktown (VA)
33. NSA Charleston (SC)
34. NAS Atlanta (GA)
35. NSB Kings Bay (GA)
36. Corry Station NTTC (FL)
37. NAS Jacksonville (FL)
38. NAS Key West (FL)
39. NS Mayport (FL)
40. NSA Orlando (FL)
41. NSA Panama City (FL)
42. NAS Pensacola (FL)
43. NAS Whiting Field (FL)

Air Force

44. Langley Air Force Base (VA)
45. Pope Air Force Base (NC)
46. Seymour Johnson Air Force Base (NC)
47. Charleston Air Force Base (SC)
48. Shaw Air Force Base (SC)
49. Moody Air Force Base (GA)
50. Eglin Air Force Base (FL)
51. Hurlburt Field (FL)
52. MacDill Air Force Base (FL)
53. Patrick Air Force Base (FL)
54. Tyndall Air Force Base (FL)

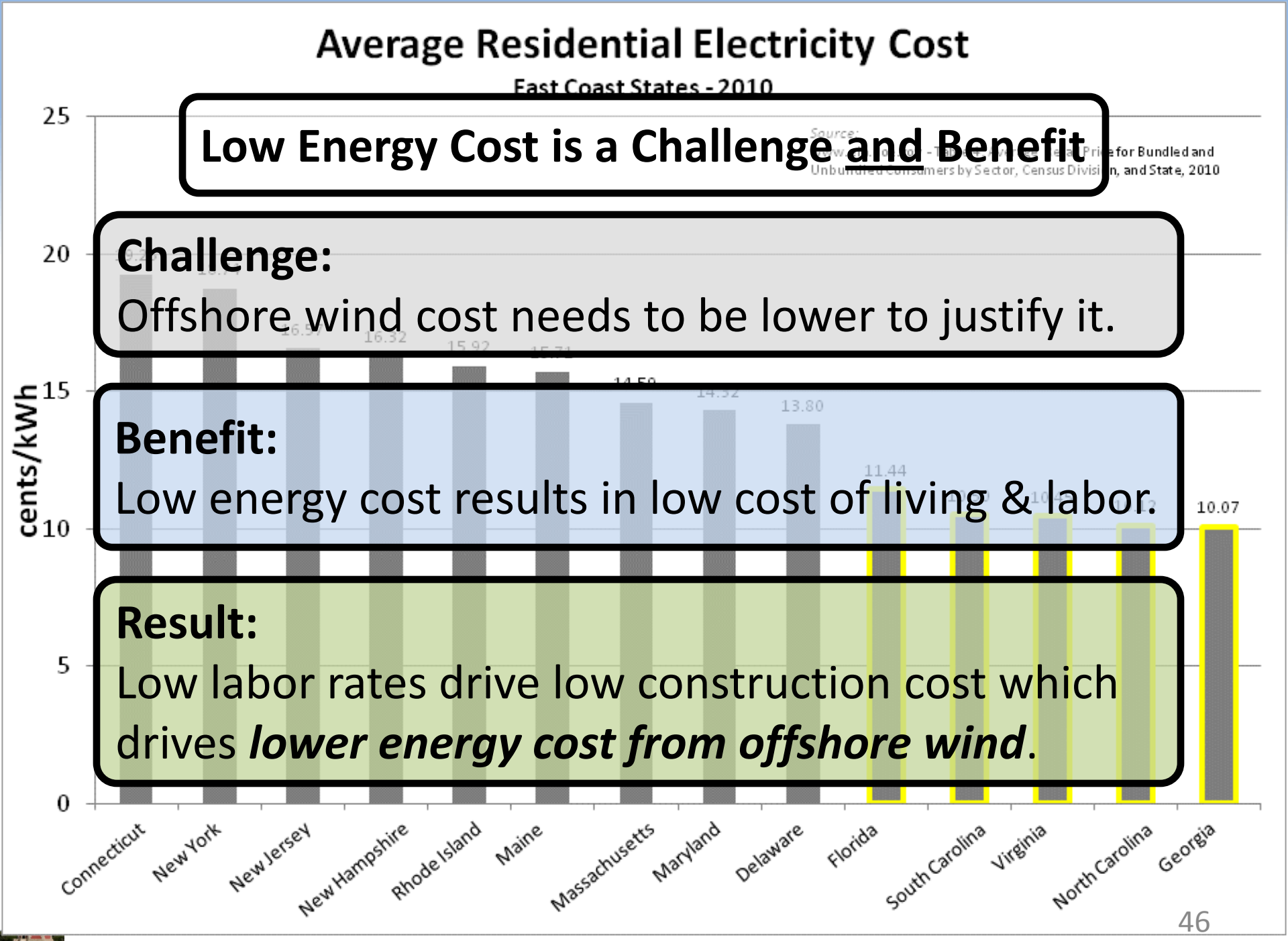
Marines

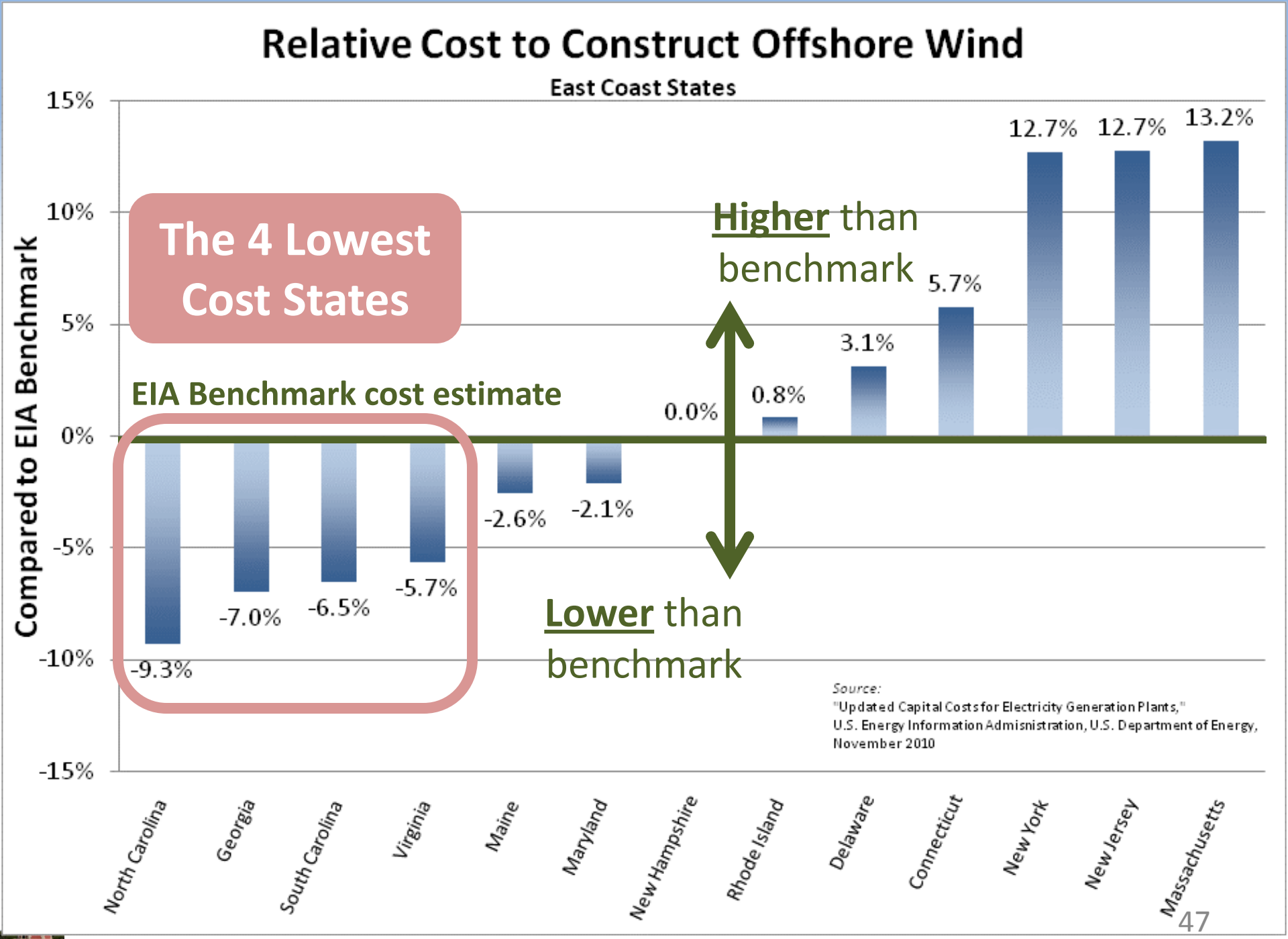
55. Henderson Hall (VA)
56. MCB Quantico (VA)
57. MCB Camp Lejeune (NC)
58. MCAS Cherry Point (NC)
59. MCAS New River (NC)
60. MCAS Beaufort (SC)
61. MCRD Parris Island (SC)
62. MCLB Albany (GA)

Source: http://en.wikipedia.org/wiki/List_of_United_States_military_bases

Low Cost

It’s cheaper to build stuff down here


Average Residential Electricity Cost
East Coast States - 2010
Low Energy Cost is a Challenge and Benefit
Challenge:
Offshore wind cost needs to be lower to justify it.
Benefit:
Low energy cost results in low cost of living & labor.
Result:
Low labor rates drive low construction cost which drives lower energy cost from offshore wind.
cents/kWh
25
20
15
10
5
0
16.32
15.92
14.32
13.80
11.44
10.07
Connecticut
New York
New Jersey
New Hampshire
Rhode Island
Maine
Massachusetts
Maryland
Delaware
Florida
South Carolina
Virginia
North Carolina
Georgia


Relative Cost to Construct Offshore Wind
East Coast States
Compared to EIA Benchmark
15%
10%
5%
0%
-5%
-10%
-15%
The 4 Lowest Cost States
EIA Benchmark cost estimate
Higher than benchmark
Lower than benchmark
-9.3%
-7.0%
-6.5%
-5.7%
-2.6%
-2.1%
0.0%
0.8%
3.1%
5.7%
12.7%
12.7%
13.2%
Source:
"Updated Capital Costs for Electricity Generation Plants,"
U.S. Energy Information Admisnistration, U.S. Department of Energy,
November 2010
North Carolina
Georgia
South Carolina
Virginia
Maine
Maryland
New Hampshire
Rhode Island
Delaware
Connecticut
New York
New Jersey
Massachusetts

So What?

Why does this stuff matter

$/month Ratepayer Impact Matters

The Southeast Has…	Effect on $/month	Why?
Large Market Size	–	Wider base to spread the cost
Low Construction Cost	–	proxy for per kWh Energy Cost
Low Electricity Rates	+	higher premium per kWh

Comparing $/month Impact (***WAY*** Oversimplified Analysis)

$/month = [Premium per kWh for OSW]*[kWh of OSW per month]

$/month = [((1+Adj%)*W$) – N$] * [W% * kWh], where:

Adj% - Weighted avg regional cost adjustment from EIA benchmark

W$ - Benchmark offshore wind cost per kWh (using 20 cents here)

N$ - Weighted average per kWh retail residential rates in the region

W% - Wind energy as a % of total regional sales

kWh – Weighted average monthly kWh usage in the region

For 5,000 MW of Offshore Wind…

Region	$/month Impact	% of Average Bill
Southeast	$2.31	1.8%
Mid-Atlantic	$2.03	1.6%
Northeast	$5.07	4.7%

Using 2010 EIA data and assuming a 38% net capacity factor

DISCLAIMER: This is intended to compare order of magnitude between regions and is <u>not</u> intended to represent an accurate estimate of $/month ratepayer impacts.

In Summary, the Southeast Has:

- The largest resource
- The lowest construction cost
- The largest electricity markets
- The fastest growing populations
- ***The potential to "go big" in offshore wind.***

Good Jobs – Clean Energy – Economic Benefits

NORTH CAROLINA
OFFSHORE WIND
COALITION

For more information:

Brian O'Hara
briano@ncoffshorewind.org
(252) 506-9463

Southeastern Coastal Wind Conference

March 8–9
2012

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Southeastern Coastal Wind Conference

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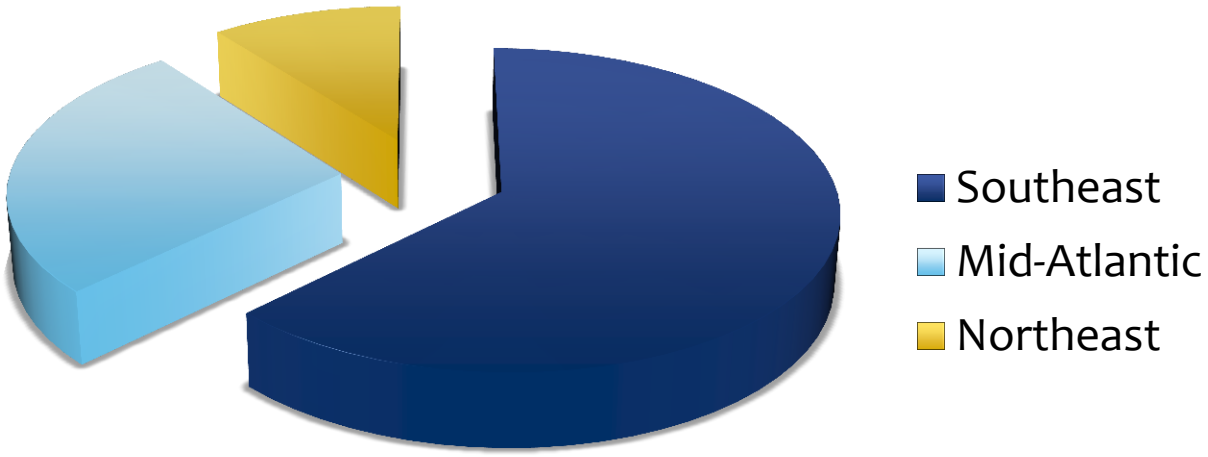
Electric Utilities in the Southeast

Hamilton Davis, Energy Director
SC Coastal Conservation League

COASTAL CONSERVATION LEAGUE

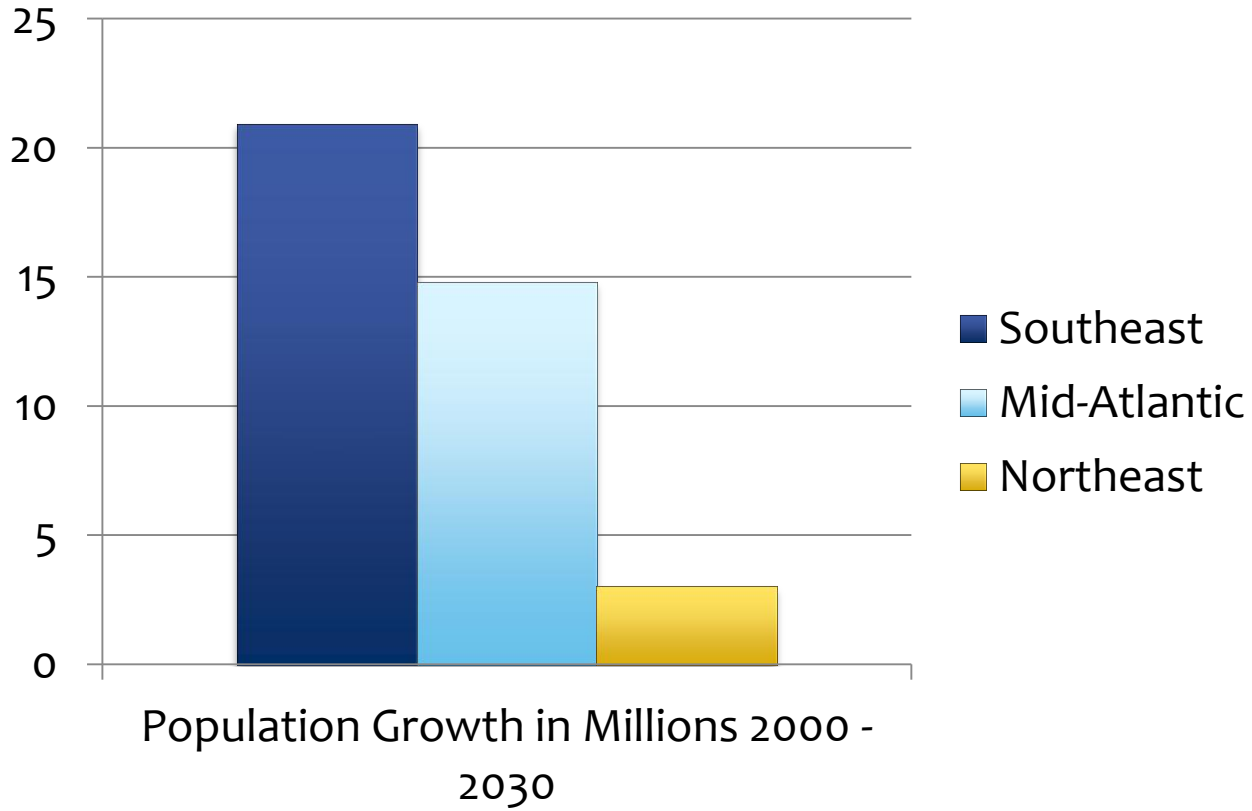
Large Energy Markets

2010 GWh Sales



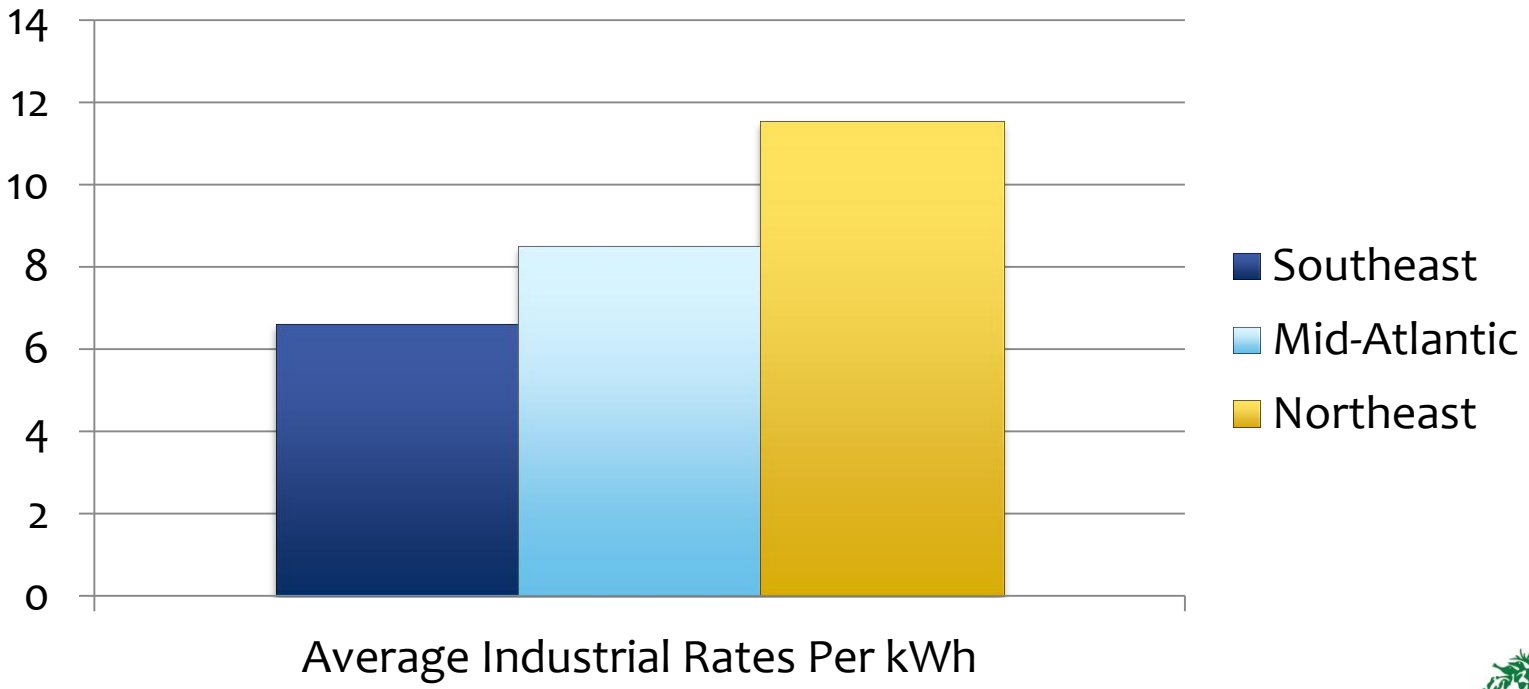
COASTAL CONSERVATION LEAGUE

Growing Populations



COASTAL CONSERVATION LEAGUE

SE Average Industrial Rates



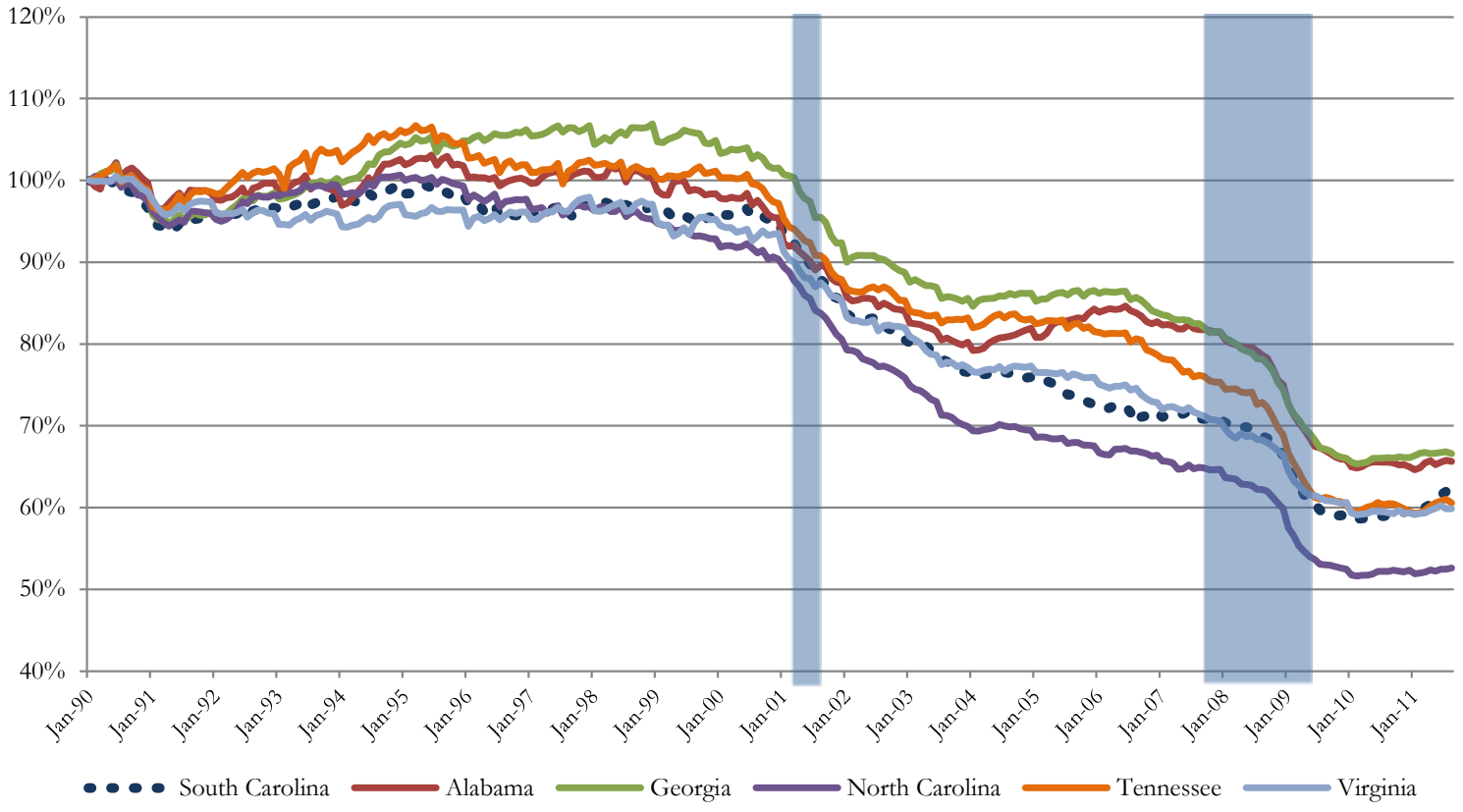
COASTAL CONSERVATION LEAGUE

SE Average Industrial Rates

- GA ~ 6.11¢ kWh
- SC ~ 5.94¢ kWh
- NC ~ 5.84¢ kWh
- VA ~ 6.68¢ kWh

COASTAL CONSERVATION LEAGUE

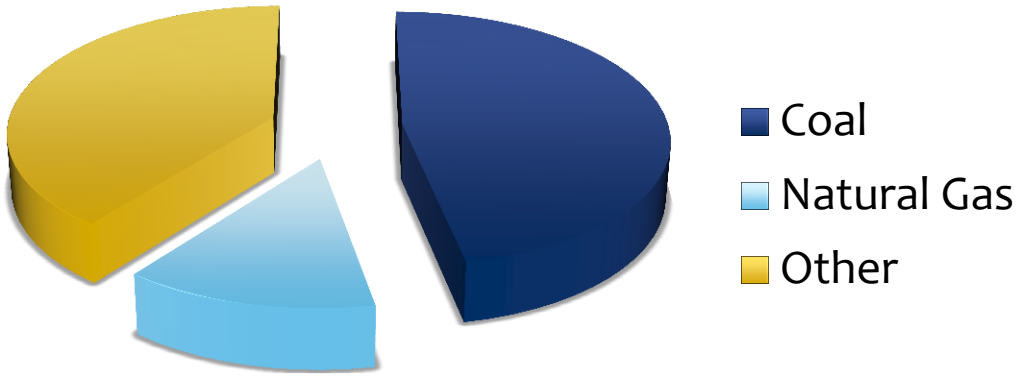
Decline in Manufacturing Employment



COASTAL CONSERVATION LEAGUE

Fossil Fuel Reliance

- Imported resource
- Price increases
- Price volatility
- Regulatory uncertainty



COASTAL CONSERVATION LEAGUE

SE Clean Energy Options

COASTAL
CONSERVATION
LEAGUE

SE Wind Projects

- Santee-Cooper
  - Palmetto Wind
- Duke Energy Carolinas
  - Offshore Wind Integration Case Study
- Dominion
  - 248MW in development, offshore interest
- Southern Company
  - Federal offshore lease application for met towers
- SCANA
  - SC Offshore Wind Collaborative

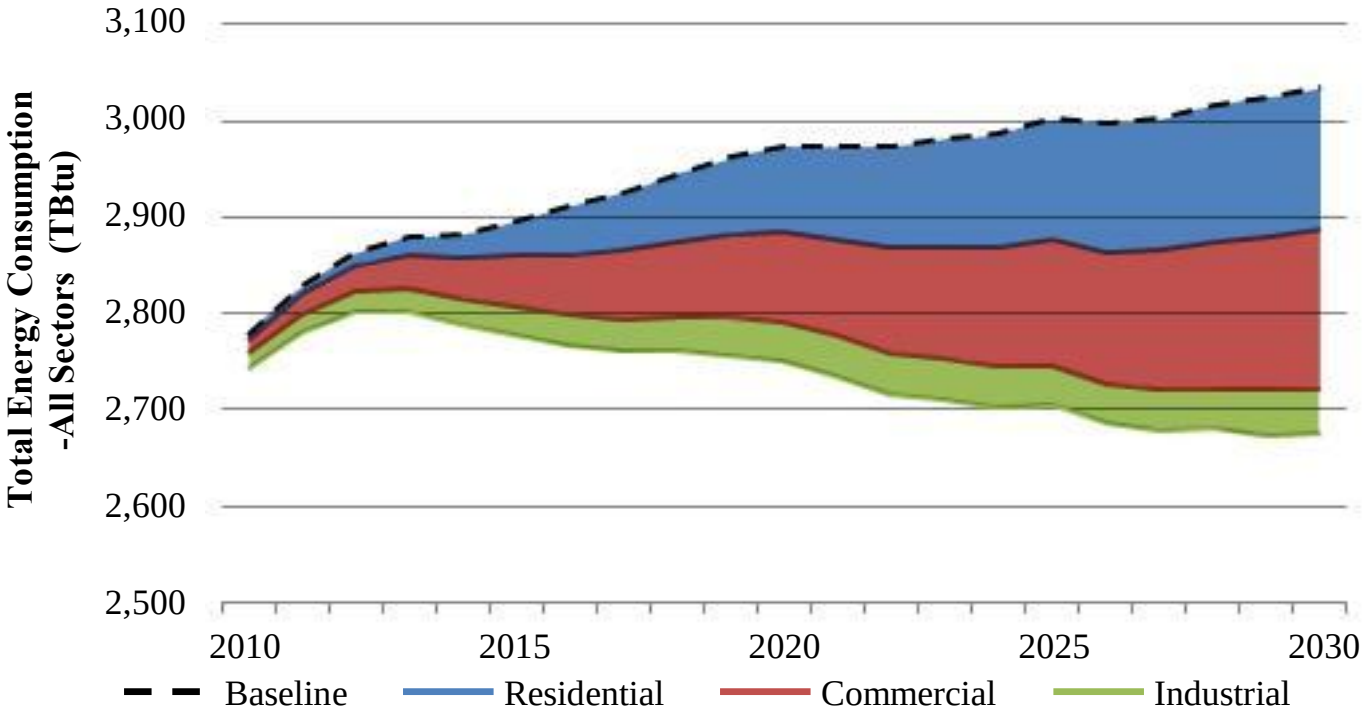
COASTAL CONSERVATION LEAGUE

Is current nuclear financing a model for wind?

- Large up-front capital costs
- Low O&M and fuel costs (~20%)
- CWIP

Energy Efficiency as a Cost Offset

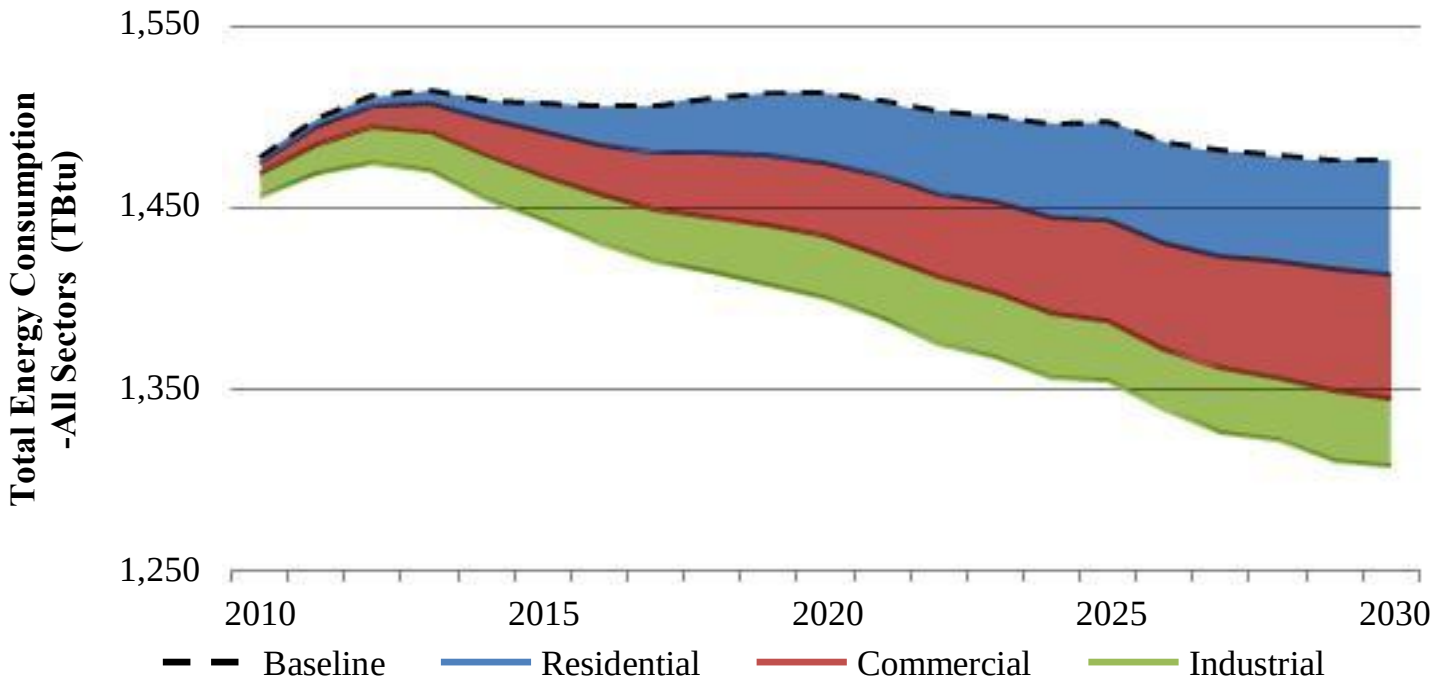
GA Energy Efficiency Potential



COASTAL CONSERVATION LEAGUE

Energy Efficiency as a Cost Offset

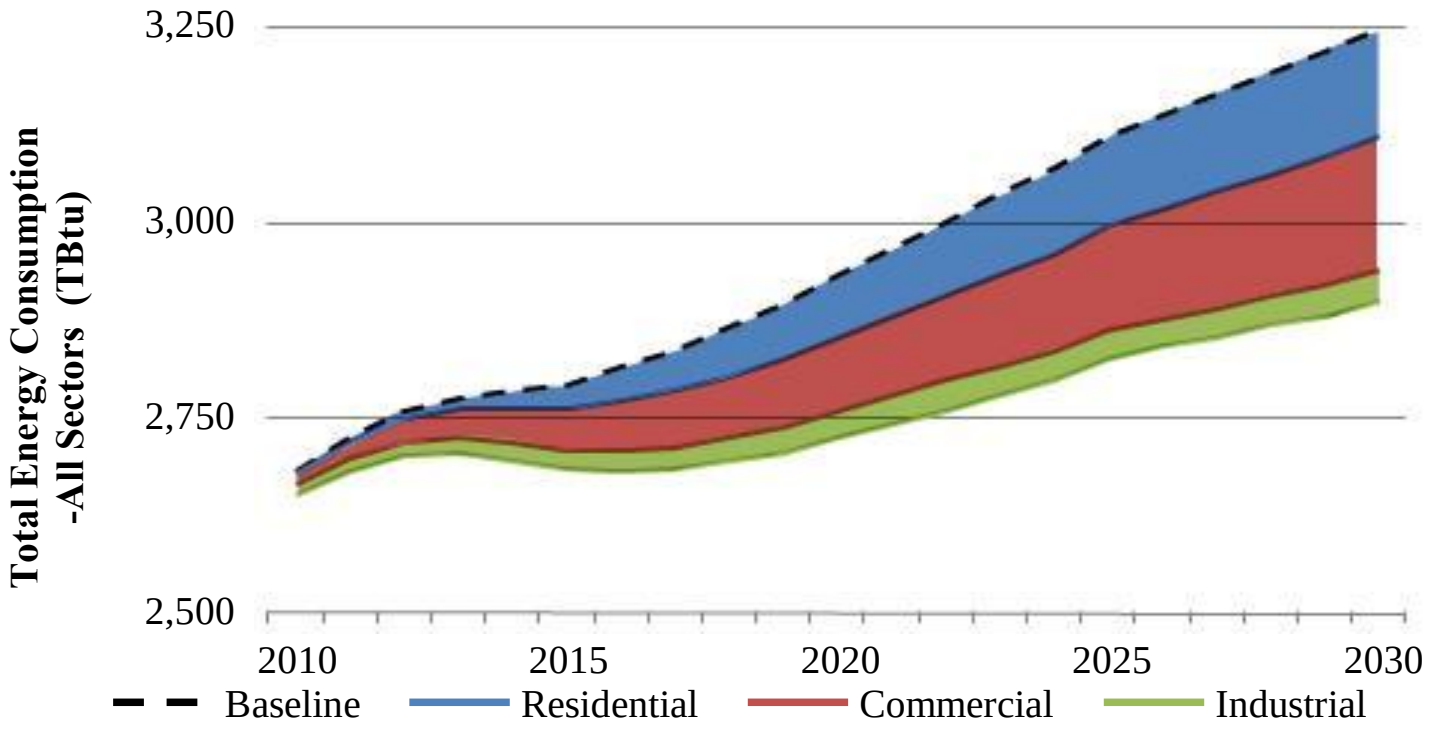
SC Energy Efficiency Potential



COASTAL CONSERVATION LEAGUE

Energy Efficiency as a Cost Offset

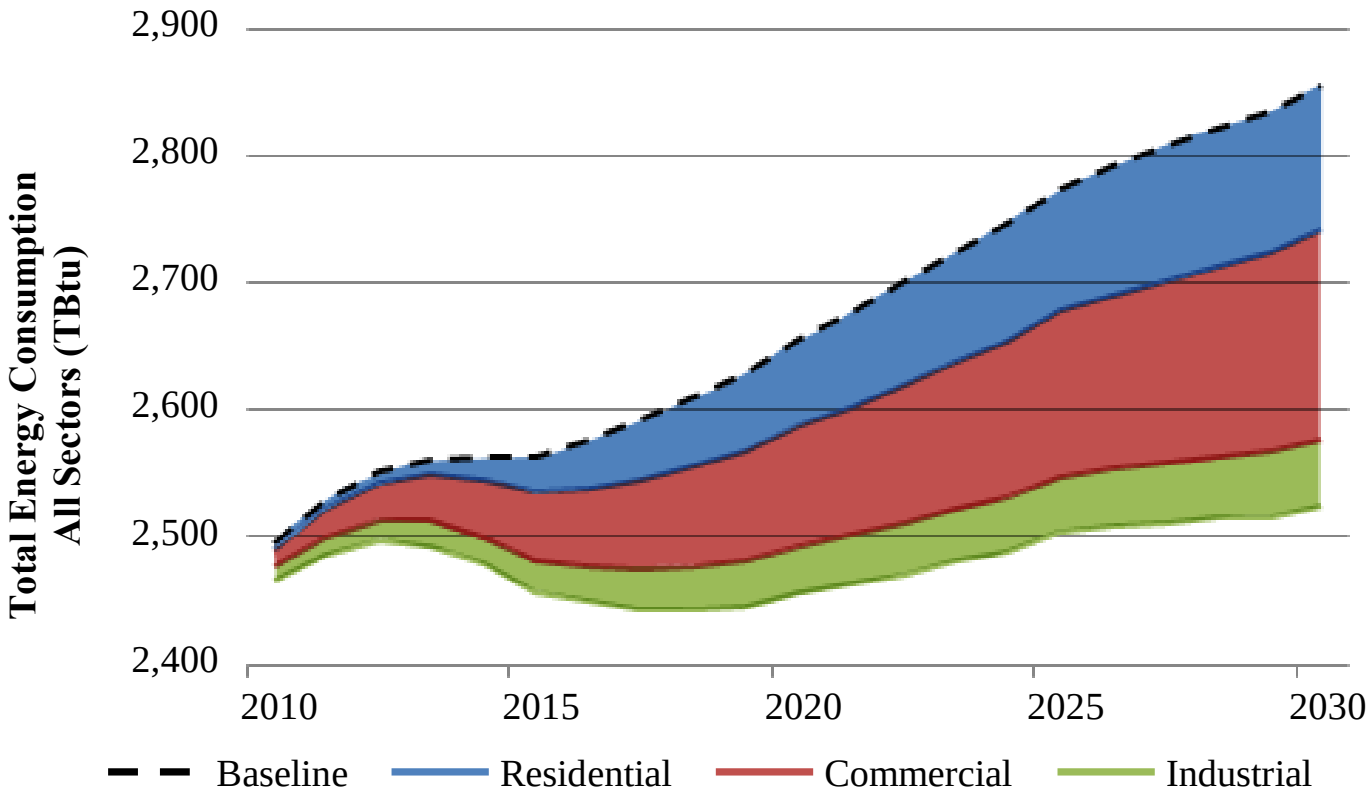
NC Energy Efficiency Potential



COASTAL CONSERVATION LEAGUE

Energy Efficiency as a Cost Offset

VA Energy Efficiency Potential



COASTAL CONSERVATION LEAGUE

Policy Influence…

COASTAL CONSERVATION LEAGUE

In summary, SE Utilities represent…

- Large energy markets
- Growing populations and increasing energy demand
- Competitive industrial rates
- Needed industrial growth
- Heavy reliance on fossil fuels
- Demonstrated interest in wind
- Unique financing structures
- Cost mitigation opportunities in EE
- Policy influence to make needed changes

COASTAL CONSERVATION LEAGUE

Thank You!

Hamilton Davis
Energy Director
SC Coastal Conservation League
Hamiltond@scccl.org
www.scccl.org

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Charlotte
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Center

Policy Considerations & Guidelines

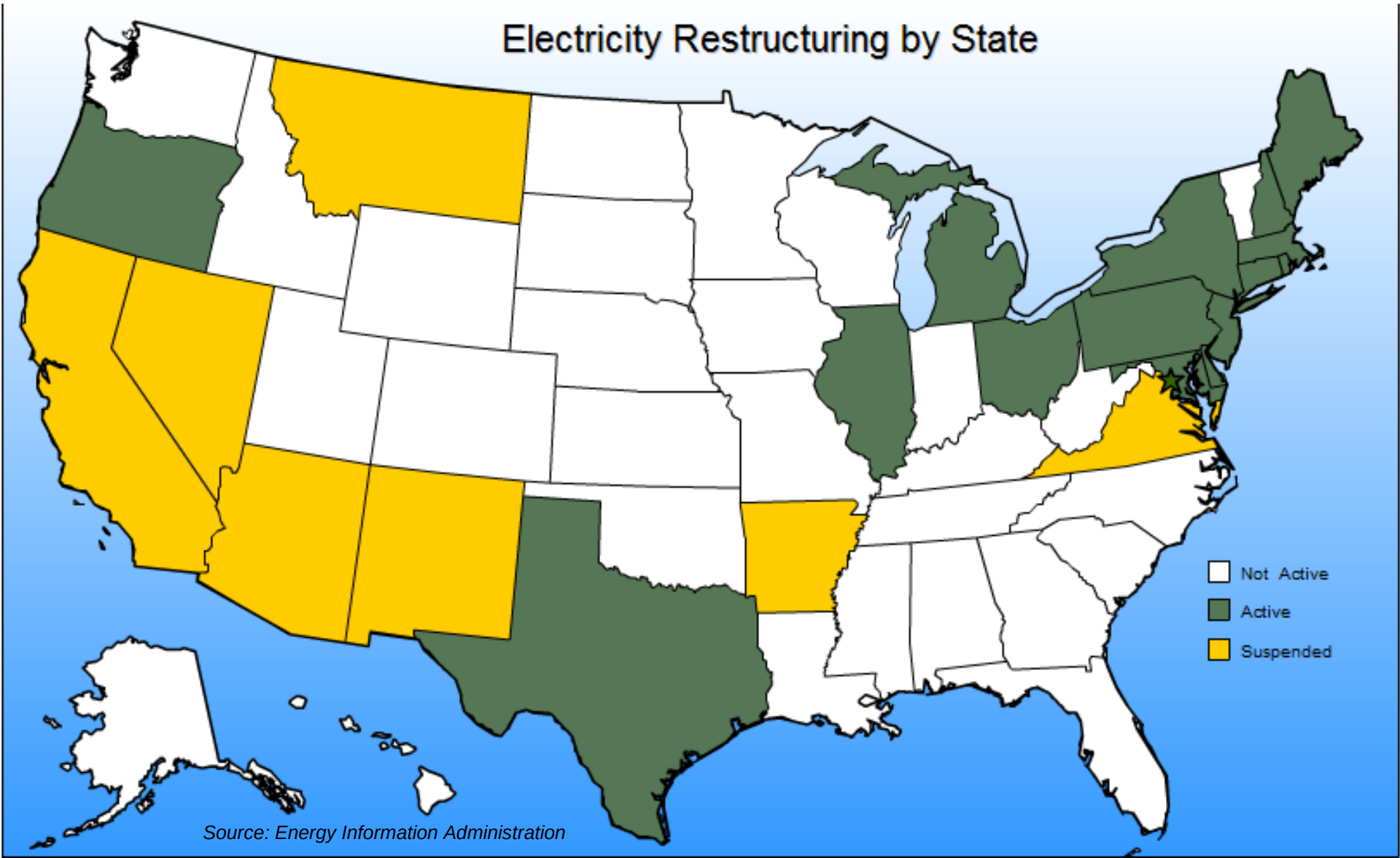
North Carolina Sustainable Energy Association
Paul Quinlan

Southeast Coastal Wind Conference
March 7, 2012

www.energync.org

NC SUSTAINABLE
ENERGY ASSOCIATION

Southeast Electric Markets are Regulated

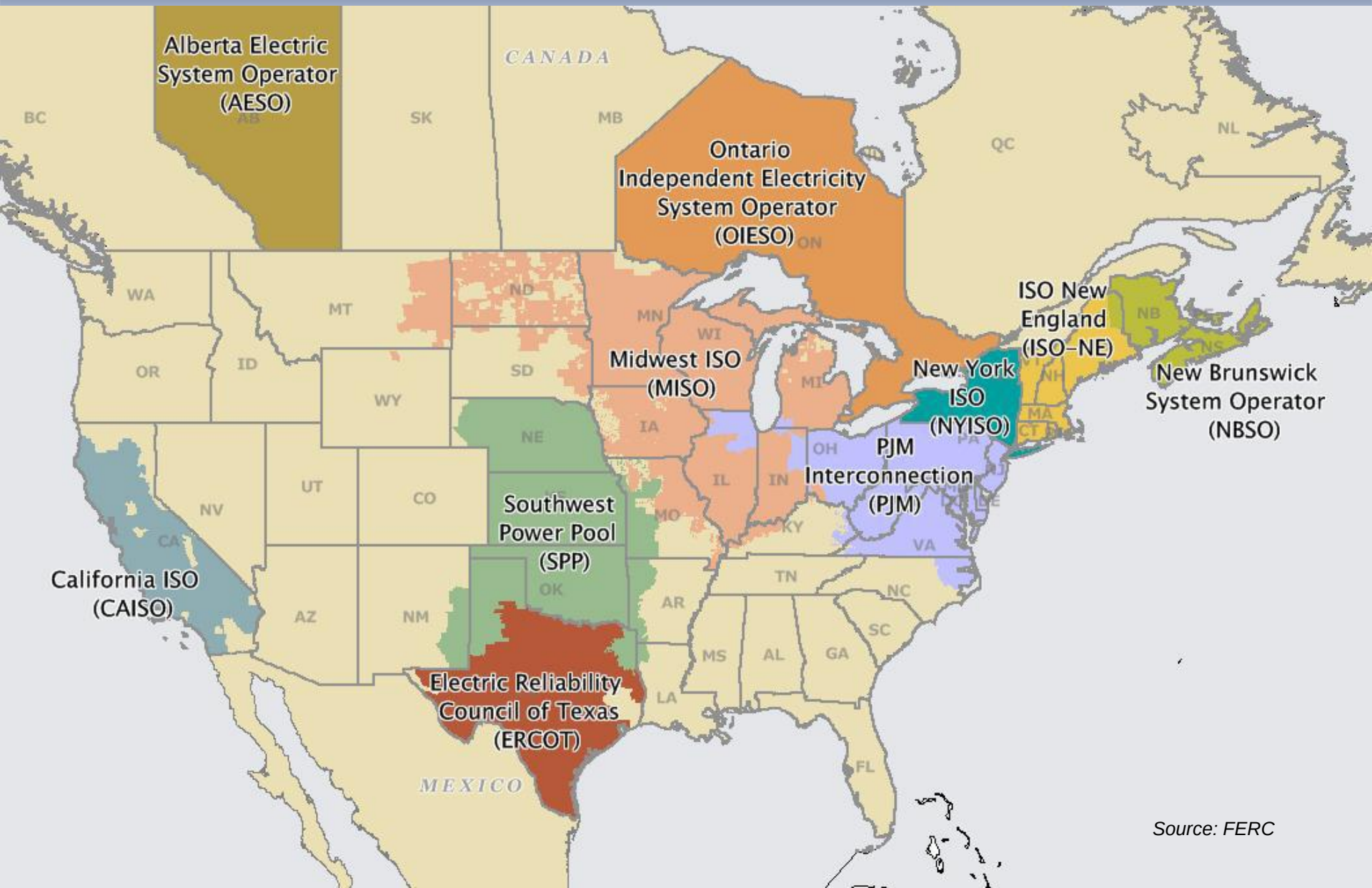


Southeast Primarily Served by Regulated Utilities

	VA	NC	SC	GA	FL
	2010 Retail Sales				
Investor Owned	85%	74%	62%	62%	76%
Cooperative, Municipal & State	15%	26%	38%	38%	24%
	2010 Retail Customers				
Investor Owned	81%	67%	56%	51%	75%
Cooperative, Municipal & State	19%	33%	44%	49%	25%

Source: Energy Information Administration

Southeast Lacks Single RTO or ISO



Source: FERC

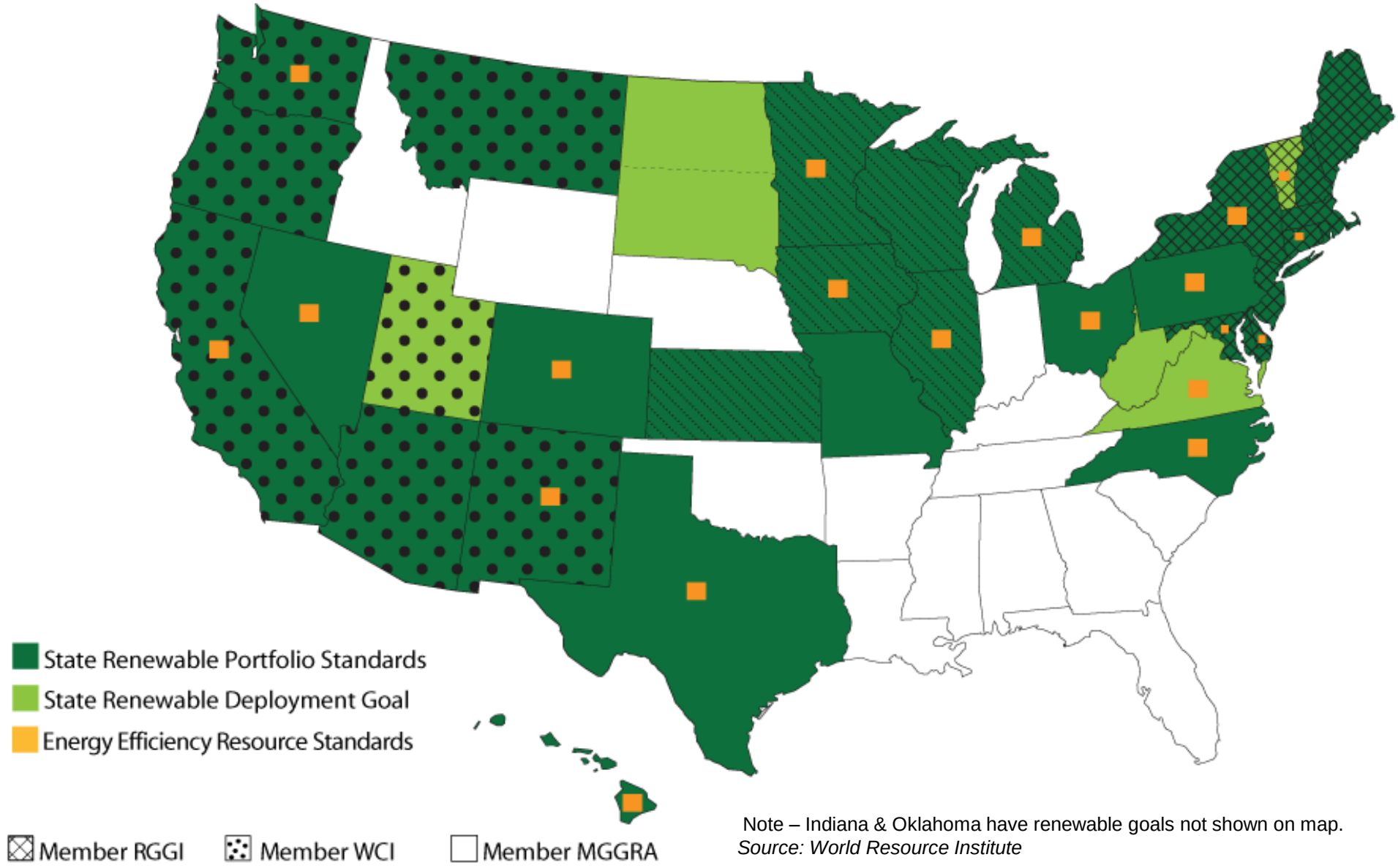
Southeast State Budgets Remain Strained

State	FY2012 Shortfalls	Shortfall as Percent of FY2012 General Fund Budget
VA	$2.0 Billion	12.3%
NC	$2.4 Billion	12.1%
SC	$630 Million	11.5%
GA	$1.3 Billion	7.6%
FL	$3.7 Billion	11.5%

- FY2013 shortfalls already projected in VA ($145M), NC ($2B), and FL ($2B).

Source: Center of Budget and Policy Priorities, February 27, 2012

Limited RPS Action; Climate Change NOT a Policy Driver



Note – Indiana & Oklahoma have renewable goals not shown on map.

Source: World Resource Institute

Clean Energy Has Strong Public Support

79% of NC voters think the REPS law, requiring renewables and efficiency, ***is a good idea***.

75% support doubling amount of renewable power ***from*** alternative sources.

Rep	Dem	Ind	< 29	> 60
73	84	78	94	74
66	80	80	81	70

45% support using coal power to meet growing needs for energy & electricity.

46% support using nuclear power to meet growing needs for energy & electricity.

Rep	Dem	Ind	Men	Wom
57	37	41	51	40
56	38	49	59	36

Digging Deeper into Coal – generational transition:
26% of 18 to 29 year olds support using coal to meet growing needs, compared to 52% of people 60 years and over.

NC SUSTAINABLE ENERGY ASSOCIATION

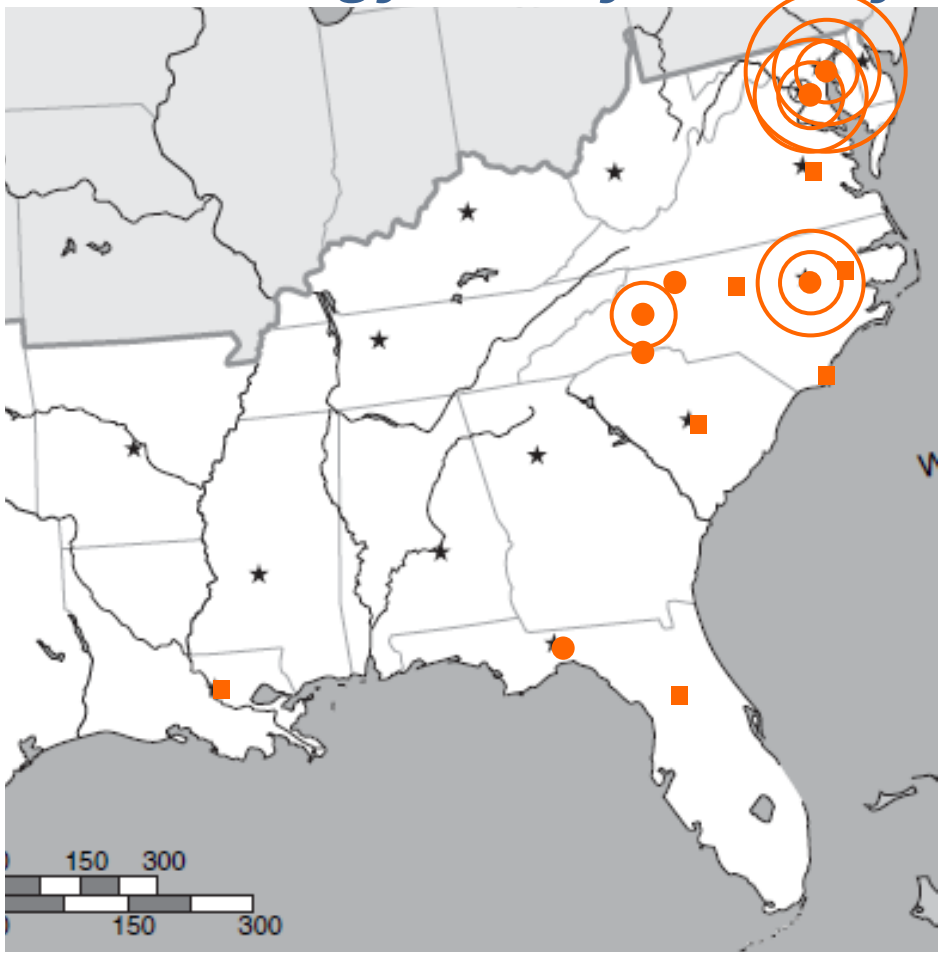
Public Supports Both Onshore and Offshore Wind

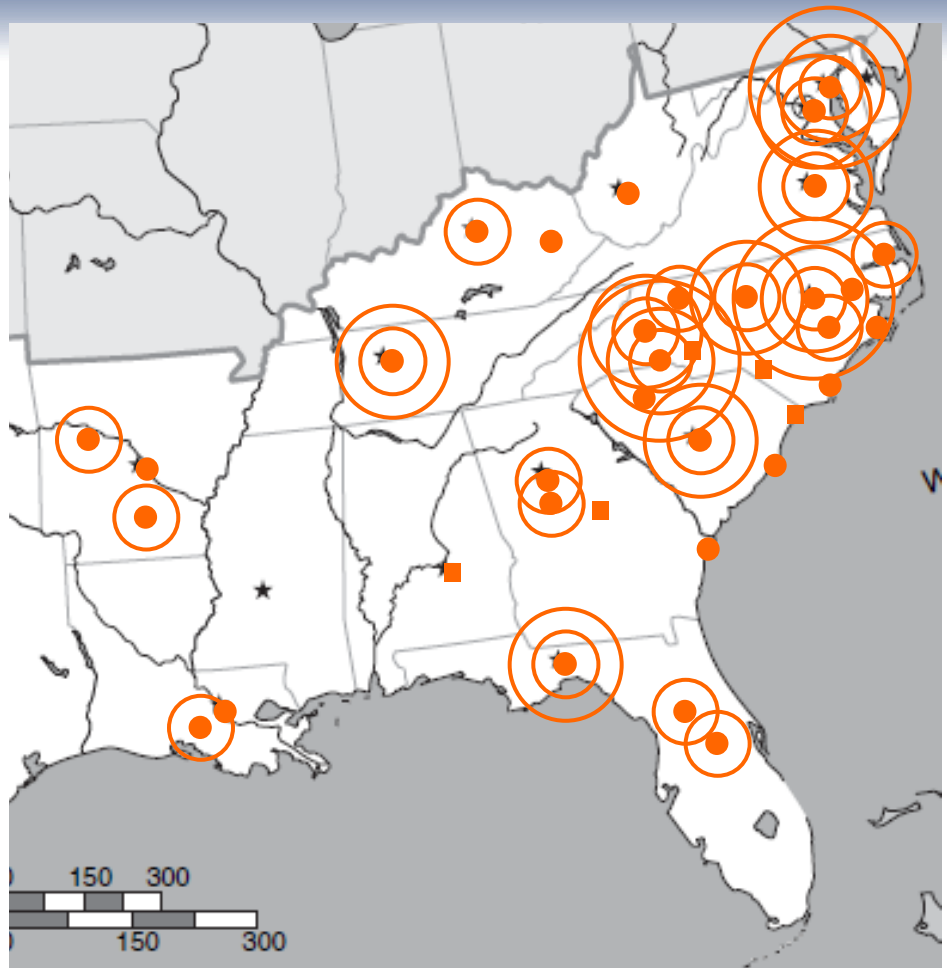
Q: Do you support or oppose using the following resources to meet our growing needs for energy and electricity to homes and businesses in North Carolina?

Solar Energy: 90.5% Support 5.1 Oppose 4.4 Unsure/no answer	**Onshore (Land-Based) Wind Energy:** 81.9% Support 13.9 Oppose 4.2 Unsure/no answer	**Offshore Wind Energy:** 82.9% Support 11.8 Oppose 5.3 Unsure/no answer
Nuclear: 46.3% Support 46.1 Oppose 7.6 Unsure/no answer	**Coal:** 44.8% Support 49.1 Oppose 6.1 Unsure/no answer	**Natural Gas:** 77.3% Support 16.7 Oppose 6.1 Unsure/no answer

Southeast Energy is Harmonizing, Regionalizing

2007 Energy Policy Activity





2012/13 Energy Policy Activity

NC SUSTAINABLE ENERGY ASSOCIATION

Source: Ivan Urlaub, NC Sustainable Energy Association

Onshore Wind Policy Guidelines

State Permitting

- Are existing permitting policies adequate?
- Separate environmental permit?

Local Permitting

- Model local ordinances can provide framework for local officials.

Offshore Wind Policy Guidelines

Define Interest

- Generation or manufacturing recruitment?

Consider Costs

- In near-term, offshore wind unable to compete in RPS (or generates a vast amount of RECs within RPS).

Consider Role of Investor Owned Utilities

- Partnership / ownership opportunities in project?

Ensure Public Benefit

- Net positive impact on citizens and/or ratepayers.
- Contributing to diversified generation portfolio.

Regional Cooperation??

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