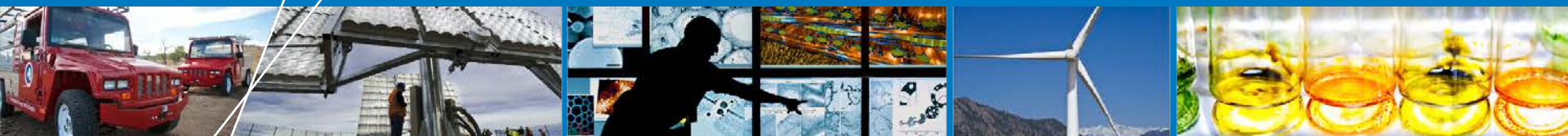


Land-based Wind Potential Changes in the Southeastern United States



Joseph Owen Roberts, NREL
**2013 Southeastern Coastal
Wind Conference**

September 11 – 12, 2013

Charleston, South Carolina

Presentation Overview

- What has changed in the past 5-10 years in turbine technology and pricing?
- What advantages does the Southeast present for wind currently and in the future?
- What is the potential for land-based wind in the Southeast?

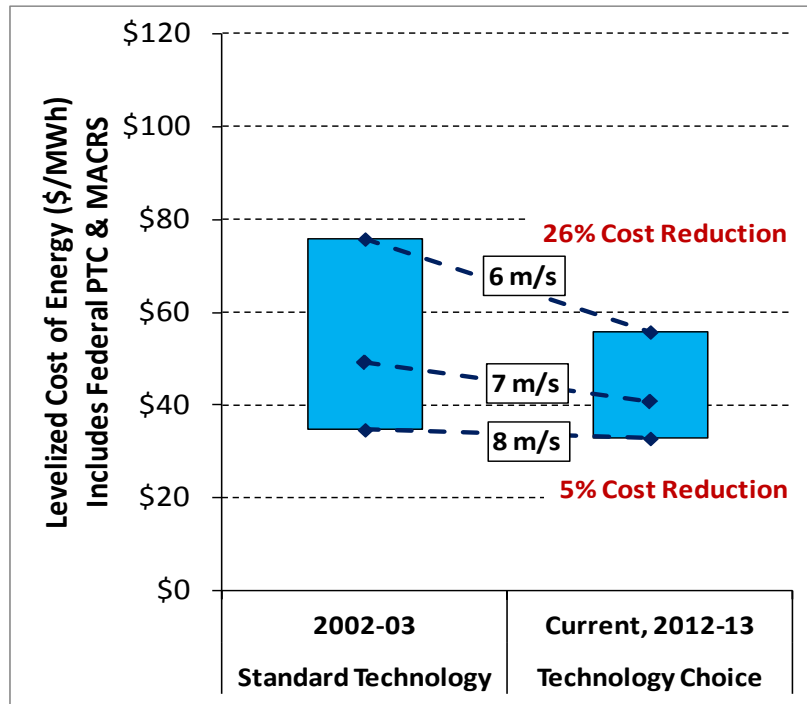
Turbine Technology and Pricing

- Impact of Improvements in O&M, Financing, and Availability (*with* PTC/MACRS)

Assumed improvements in O&M costs, financing rates, and availability lead to substantial additional estimated LCOE reductions from 2002-2003 to 2012-2013 in comparison to core analysis that only varies capital cost and capacity factor

Core Assumptions

only varies capital cost and capacity factor



Side Analysis Assumptions

also varies O&M, availability, and financing

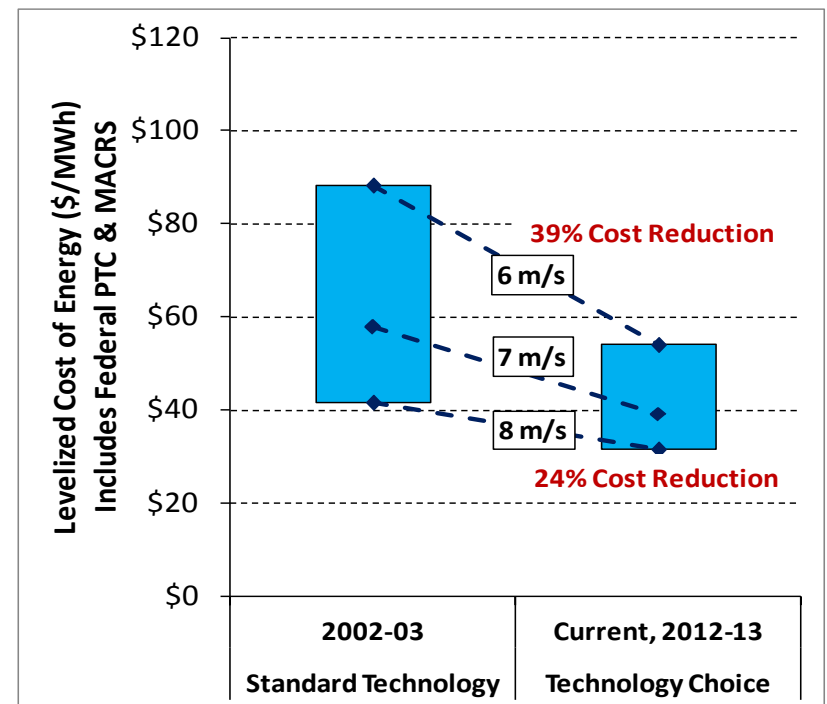


Figure 1. Core Assumptions. Wiser, R.; Lantz, E.; Bolinger, M.; Hand, M. (February 2012). *Recent Developments in the Levelized Cost of Energy from U.S. Wind Power Projects*.

<http://eetd.lbl.gov/ea/ems/reports/wind-energy-costs-2-2012.pdf>

Figure 2. Side Analysis Assumptions. Wiser, R.; Lantz, E.; Bolinger, M.; Hand, M. (February 2012). *Recent Developments in the Levelized Cost of Energy from U.S. Wind Power Projects*.

<http://eetd.lbl.gov/ea/ems/reports/wind-energy-costs-2-2012.pdf>

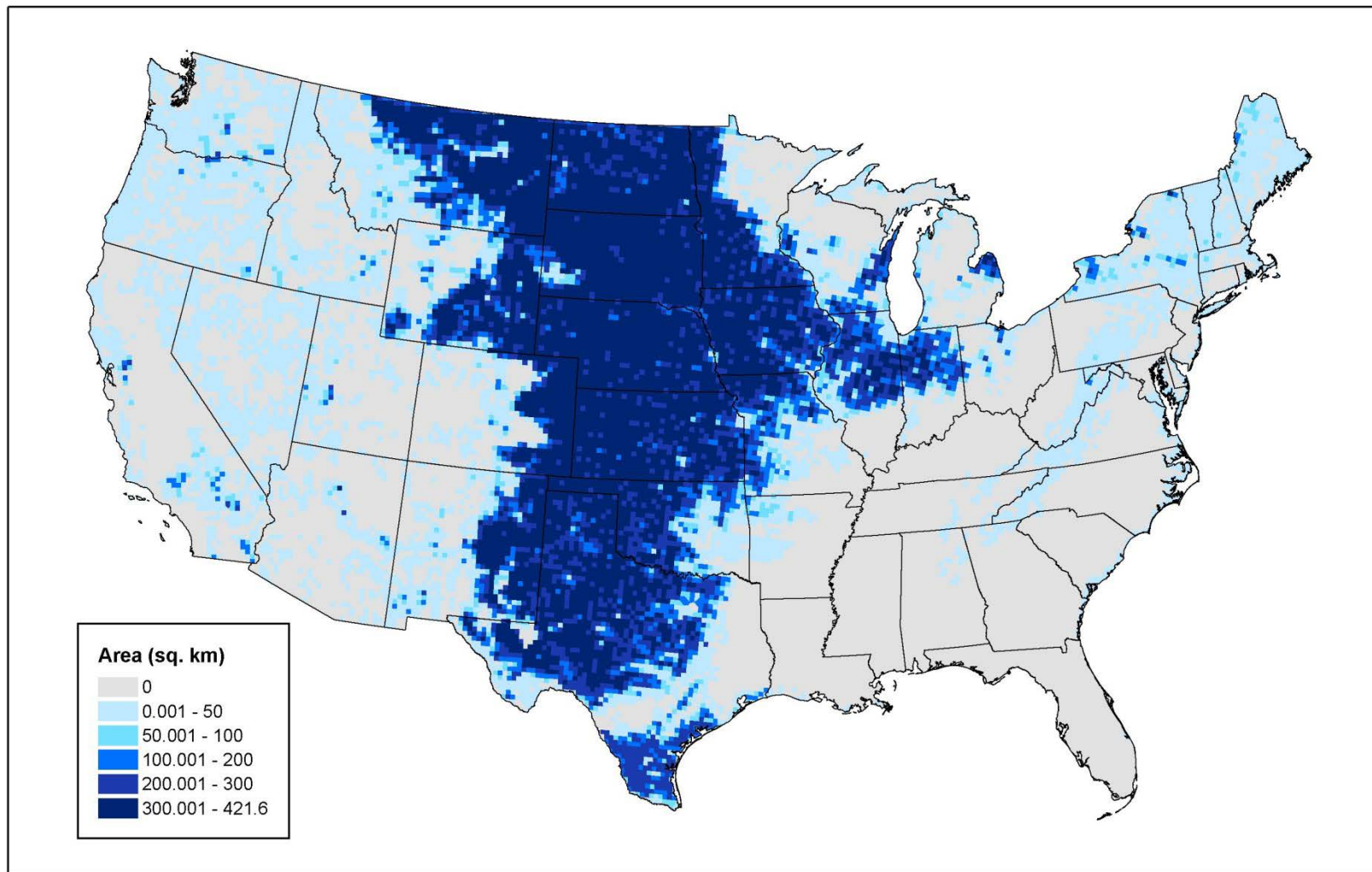
Southeast Advantages

- Electrical and transportation infrastructure
- Potentially available land
- Electrical demand (EIA projects 25% demand increase by 2040)
- Proximity to load centers
- >2GW of PPAs for Southeast already for wind

Assumptions for Wind Potential Study

- Wind Data from AWS Truepower 200m resolution binned data at 20km resolution, long term adjusted hourly wind speed data
- GE 1.62-100, GE 1.62-82.5, GE 1.5-77, Nordex N117-2.4 turbines
- Wind data adjusted for air density and appropriate IEC class turbine selected for average annual wind speed
- These maps and statistics exclude all urban areas, bodies of water, national parks, and ½ of the area in forest service lands.
- Shading is raw area available land (darker blue is more available area)

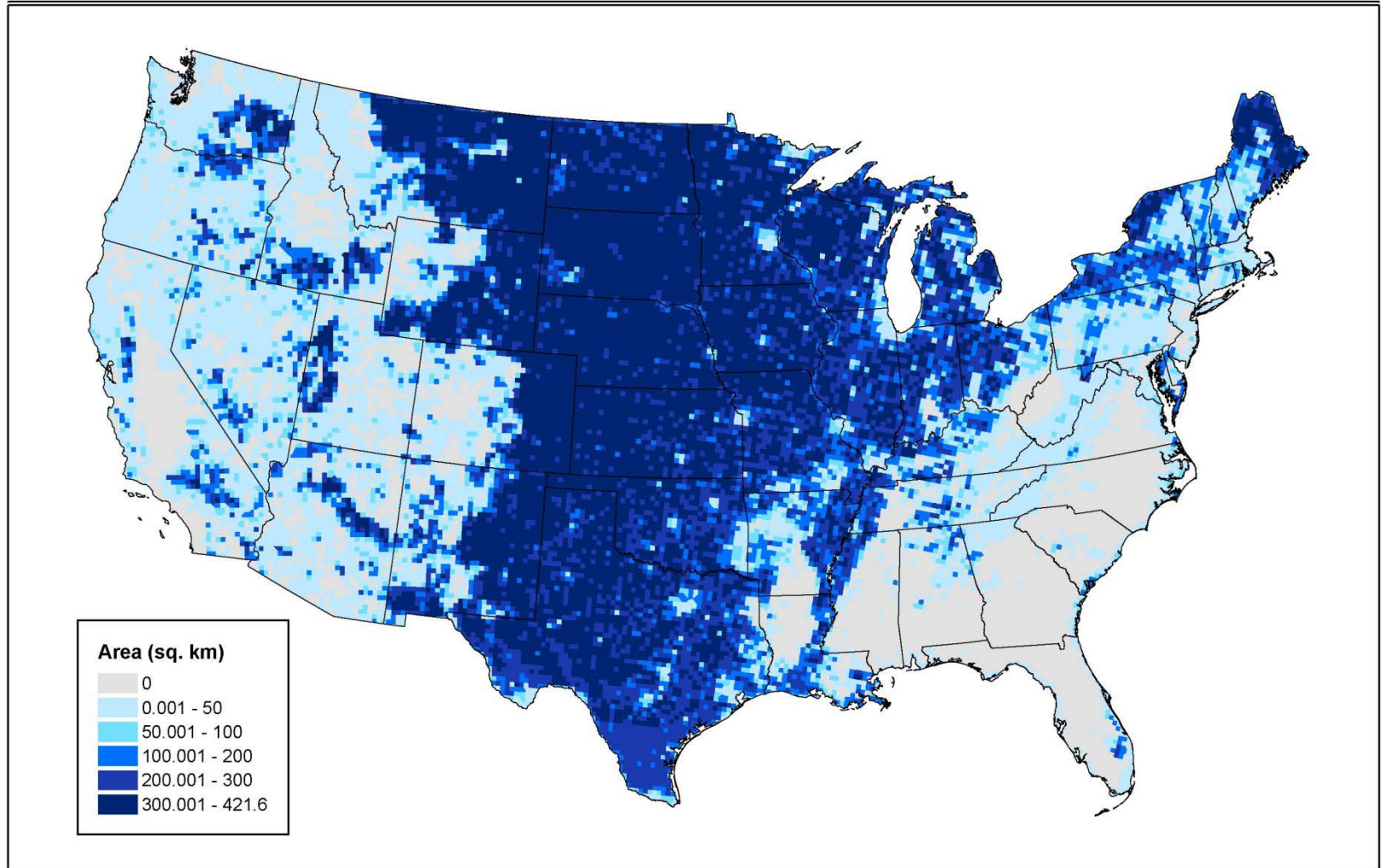
Past Estimates (GCF>30% IEC Class 2 turbine 80m HH)



Source: Donna Heimiller, NREL.

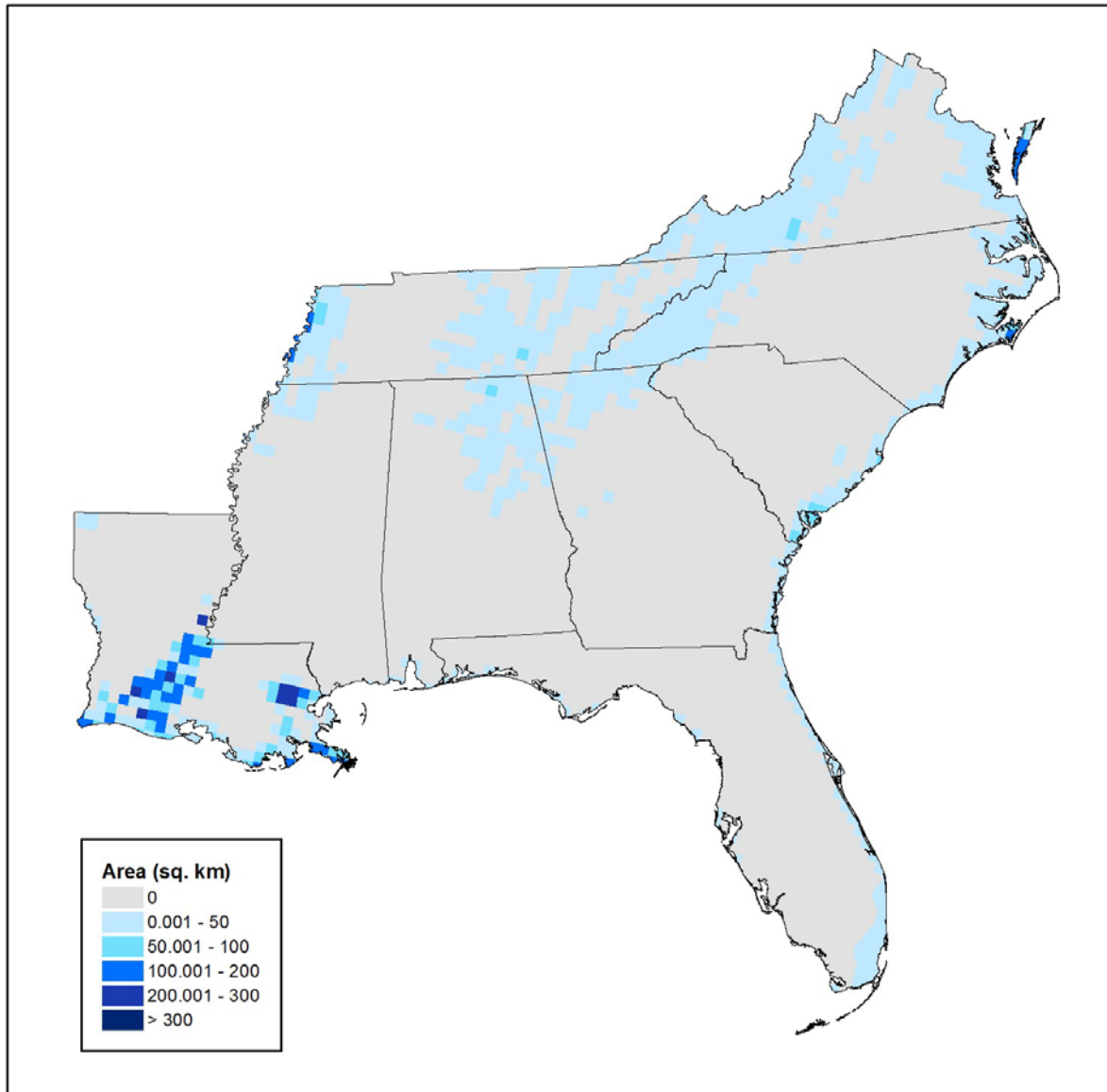
New Estimates (GCF>30% GE 1.62-100 80m HH)

- Increase in raw area available ~50.6% over previous estimate



Source: Donna Heimiller, NREL.

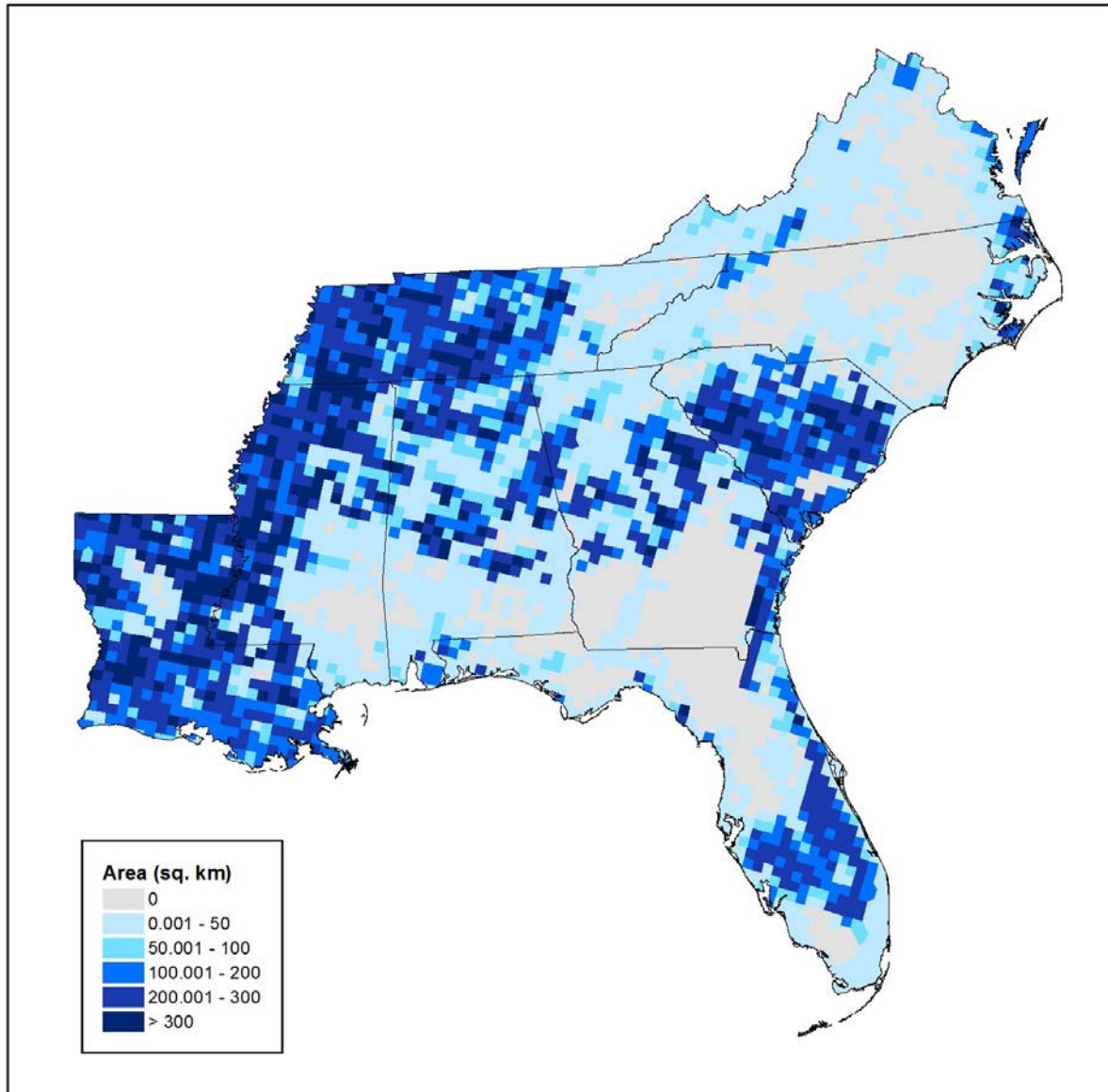
New Estimates (GCF>35% GE 1.62-100 80m HH)



Source: Donna Heimiller, NREL.

80m Area with CF \geq 35%

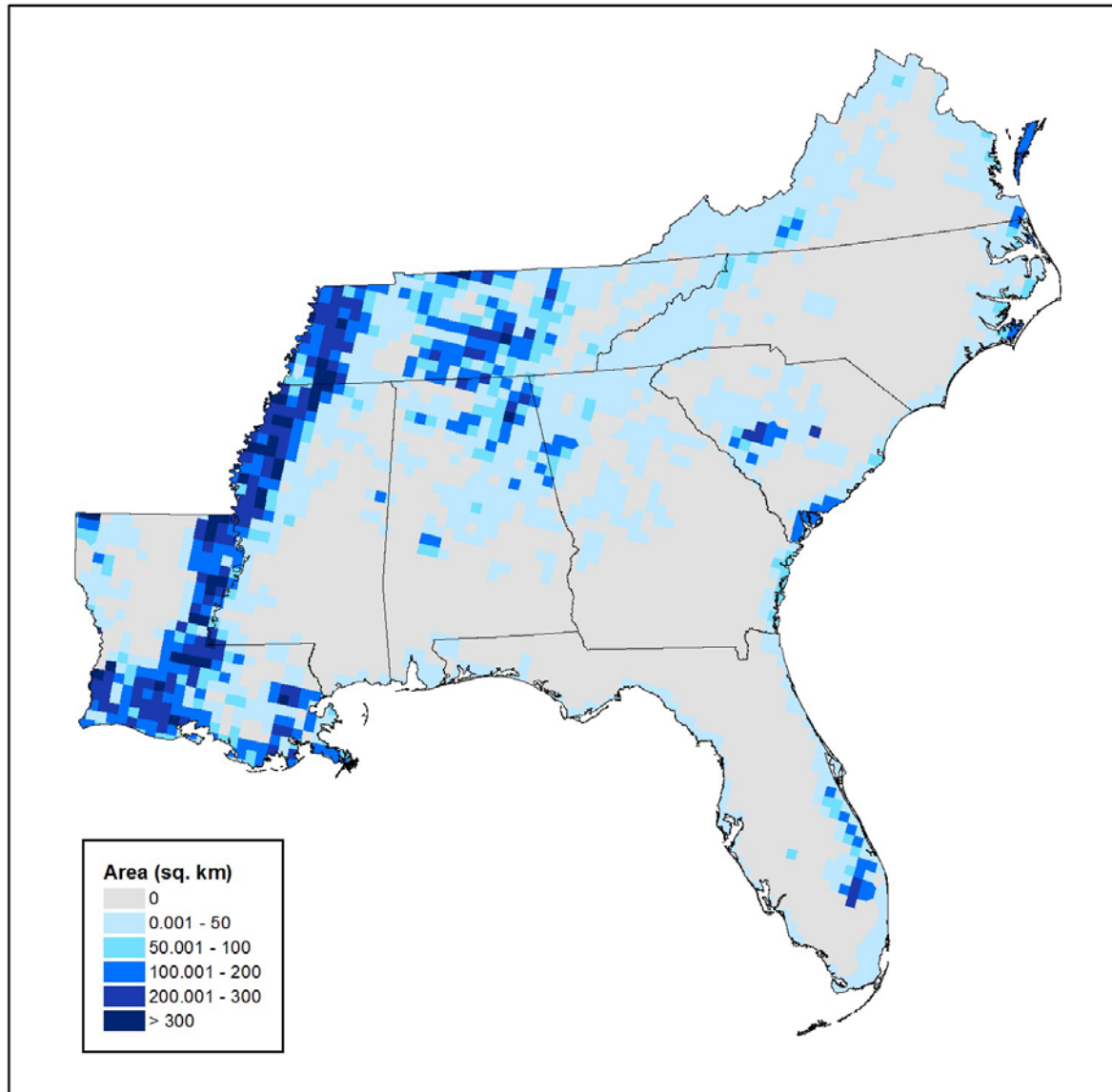
New Estimates (GCF>30% GE 1.62-100 110m HH)



Source: Donna Heimiller, NREL.

110m Area with CF >= 30%

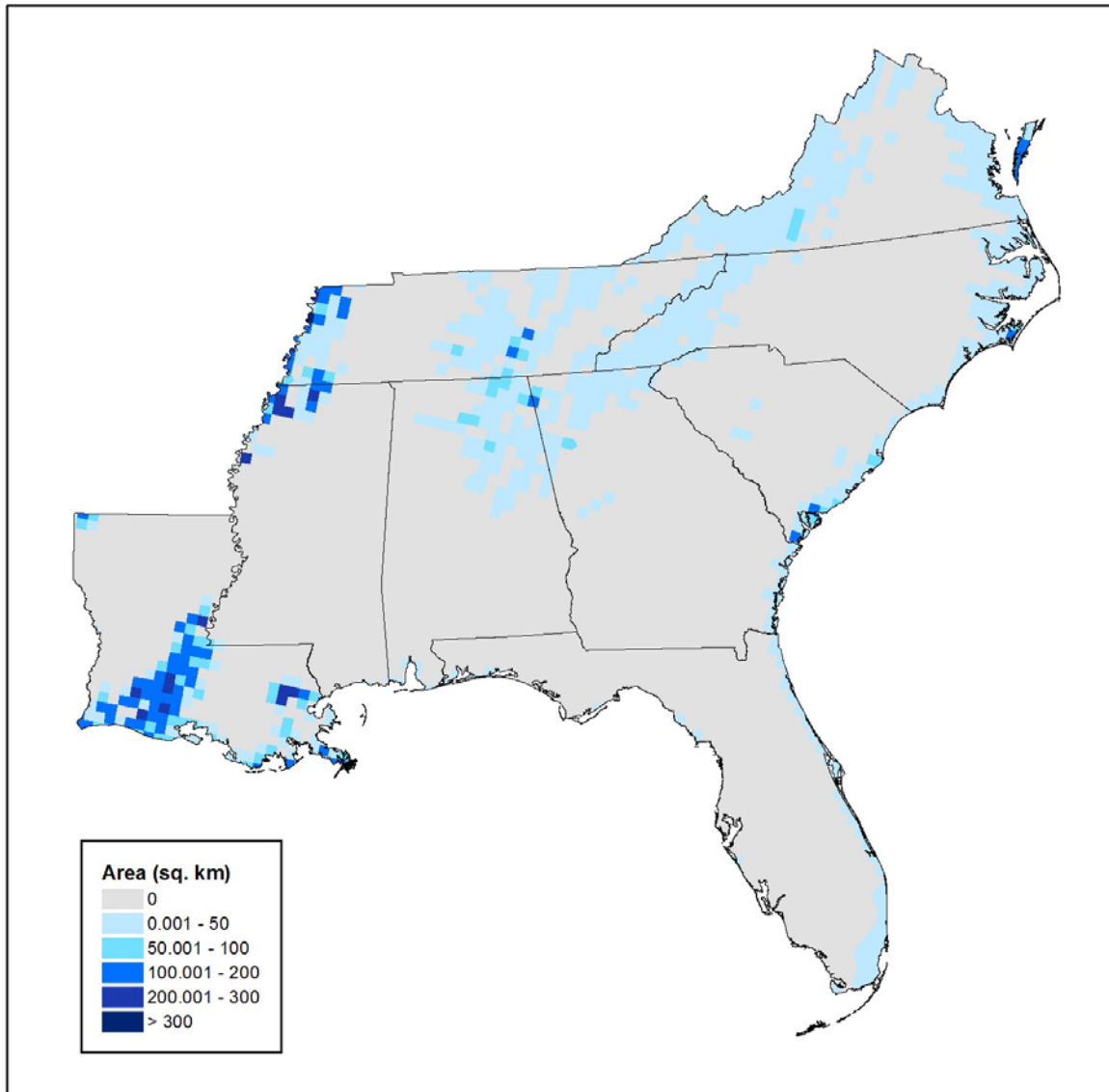
New Estimates (GCF>35% GE 1.62-100 110m HH)



Source: Donna Heimiller, NREL.

110m Area with CF >= 35%

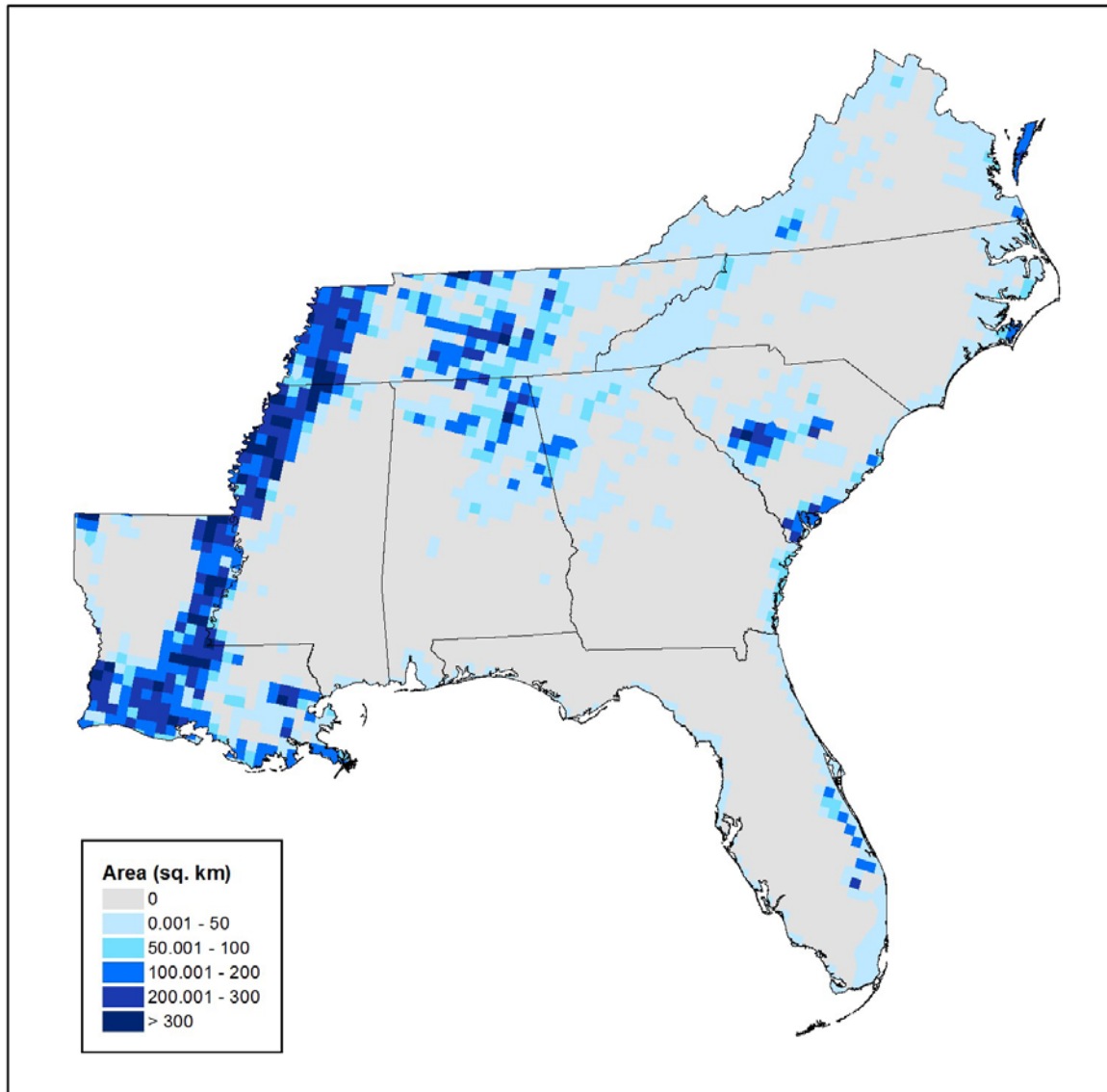
New Estimates (GCF>40% GE 1.62-100 110m HH)



Source: Donna Heimiller, NREL.

110m Area with CF \geq 40%

New Estimates (GCF>40% N117-2.4 140m HH)

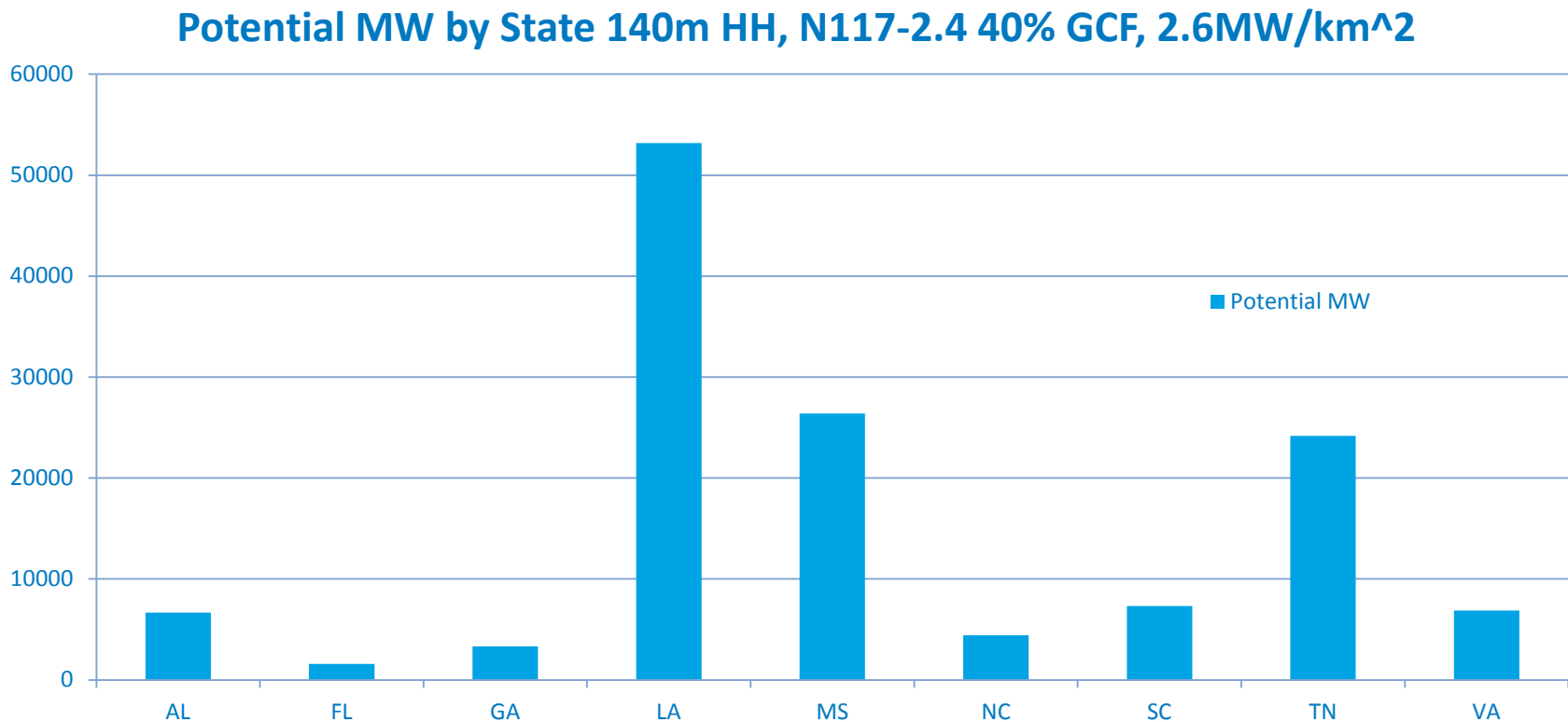


Source: Donna Heimiller, NREL.

140m Area with CF >= 40%

Current Technology Potential

- Assumes N117-2.4 140m hub height, 40% GCF, 2.6MW/km²
- Total area developable assuming typical exclusions
- Total potential 134 GW for states as below



Caveat- Uncertainty in this wind data is high as little validation data at these hub heights is available.

Siting considerations for Wind Development in the South

- FAA height restriction permitting uncertainty for taller towers
- Local communities not accustomed to wind development
- Transportation infrastructure for turbine components might need adjustments and requires detailed scheduling
- Conventional tower technology (base diameter)
- Crane availability for tall towers and heavy nacelles may be limited
- Wildlife habitat, flight, and migration areas require appropriate siting

Next Steps

- NREL will release new potentials for installed capacity by state; potential for more impact in the South
- New Department of Energy and National Laboratory Wind Vision report using modern turbine technology and wind data
- Potential cost of energy modeling of current and future technologies

Thanks to George Scott, Donna Heimiller, Dennis Elliott, Eric Lantz, Suzanne Tegen, Maureen Hand, and Ian Baring-Gould of NREL as well as AWS Truepower for their work and support!

Questions?



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Photo by Joseph Owen Roberts, NREL