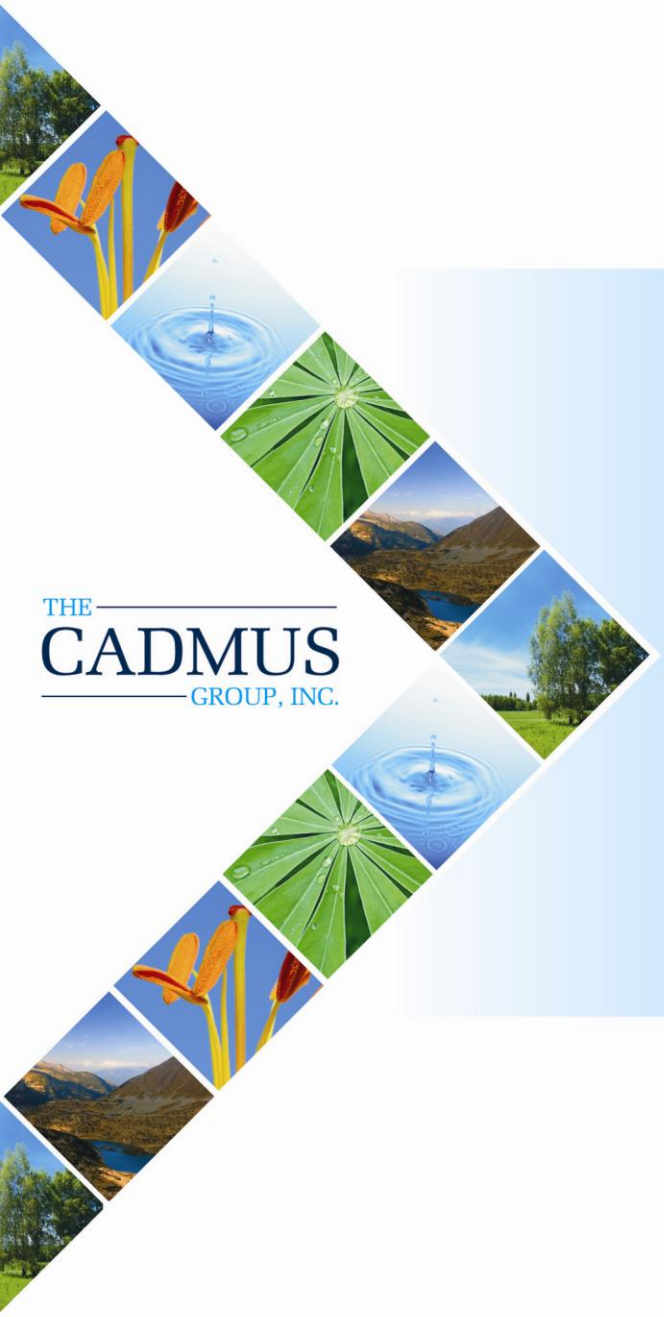


THE CADMUS GROUP, INC.

State of Missouri MDNR-DE

Missouri Energy Stakeholder Process

Renewable Energy Meeting

11/10/2011

The Cadmus Group

Team Members

- The Cadmus Group
  - Paul Parker, Project Manager
  - Amy Ellsworth, Deputy PM
- RESOLVE
  - Adam Saslow, Lead facilitator
- GSM
  - Gwen Mizell/Michele Wynn, Local Project Coordination

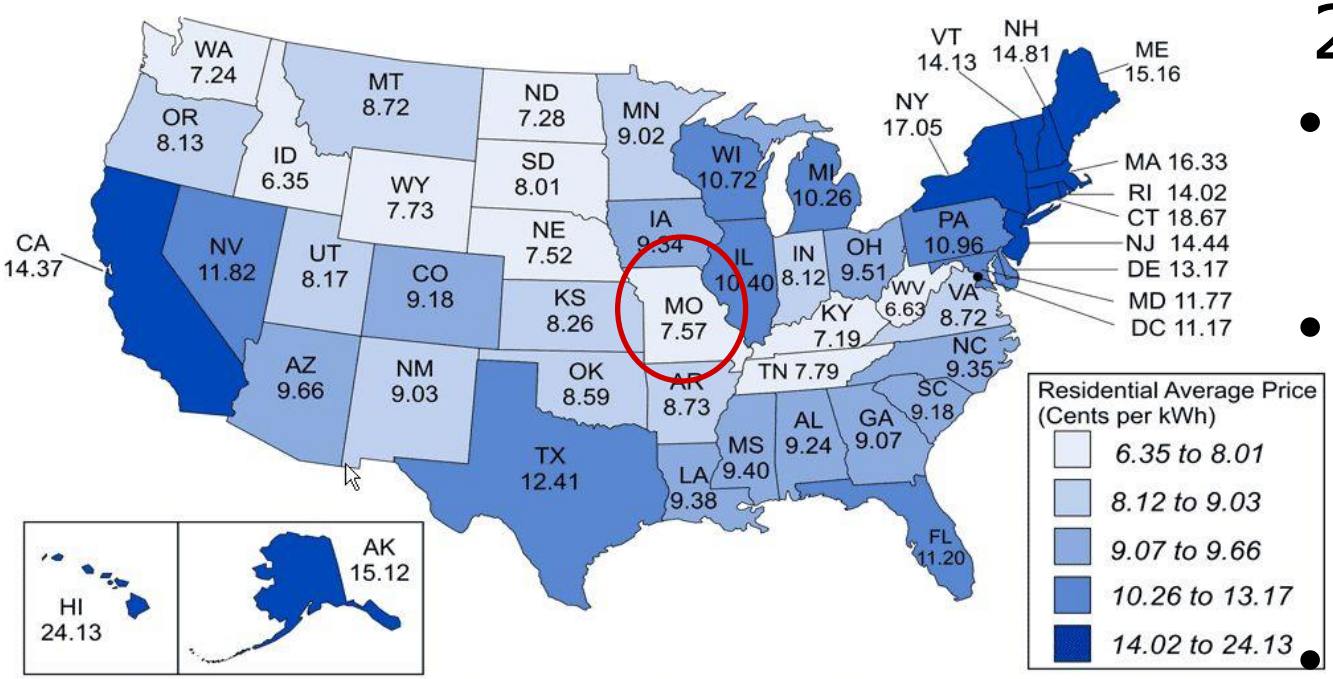
Introduction

Goals:

- Maintain competitive costs for Missourians
- Promote cleaner, greener economy that includes more renewable energy
- Provide strategies to achieve all cost-effective energy efficiency savings
- Achieve greater energy security through energy choices

Goal: Maintain competitive energy costs for Missourians

The U.S. average residential retail price of electricity was 10.64 cents per kilowatthour in 2007.

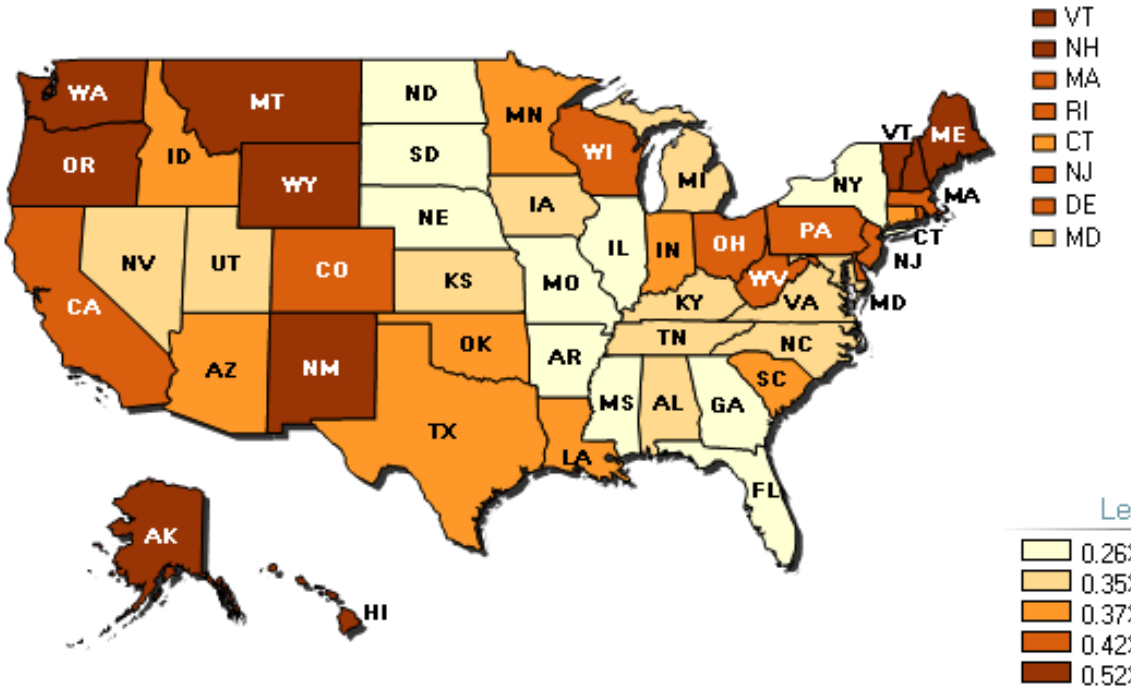


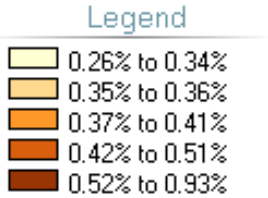
Source: Energy Information Administration, Form EIA-826, "Monthly Electric Sales and Revenue with State Distributions Report."

- 7.35¢/kWh in 2009
  - 9th lowest electricity cost per kWh in U.S.
  - But buildings consume energy at one of the highest rates per capita
  - And demand is growing

THE CADMUS GROUP, INC.

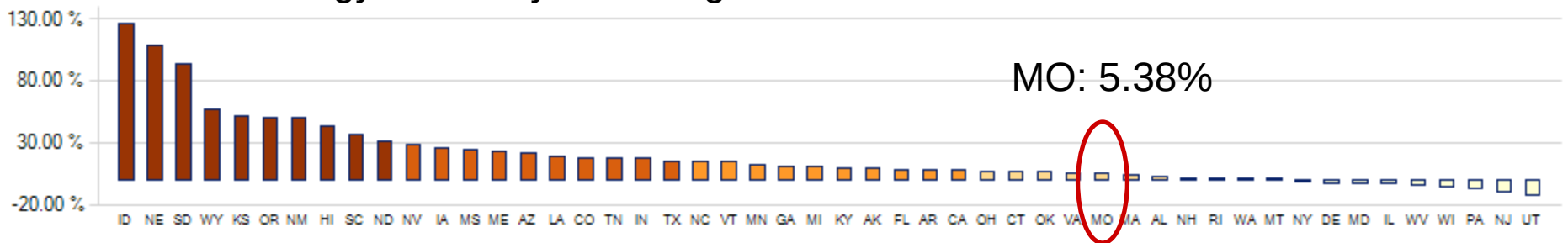
Goal: Promote cleaner, greener economy that includes more renewable energy





- Missouri has 0.33% share of clean energy economy businesses in US

Clean energy economy relative growth rate 1998-2007



Goal: Promote cleaner, greener economy that includes more renewable energy

Renewable Energy Standard

- Mandatory renewable electricity standard of 15% by 2021 with 0.3% of retail electricity sales derived from solar electricity.
- Current total renewable net generation: 2.7%

Renewable Energy Potential

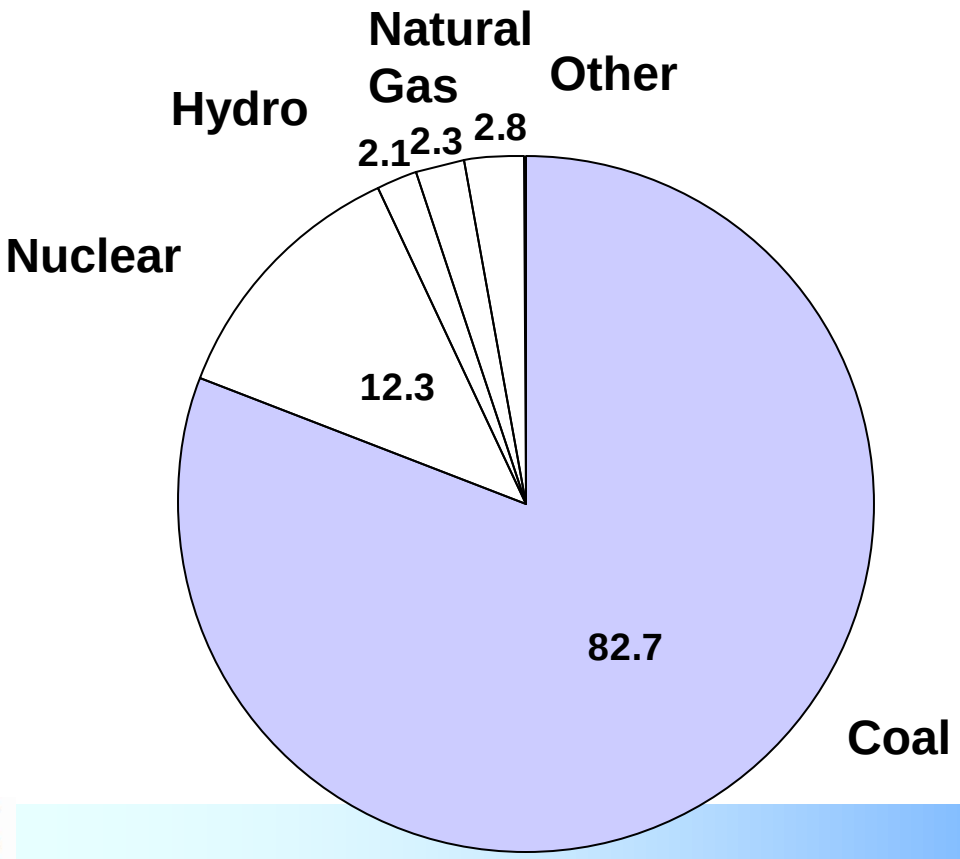
- Biomass: significant throughout the state, especially in the north and southeast
- Solar: Very good throughout the state
- Wind: viable, mostly in the northwest

Goal: Achieve greater energy security through energy choices

- Energy Security:
  - Diversity: reducing reliance on any one source of imported energy
  - Local resource use: exploiting native fossil fuel or renewable energy resources, and
  - Efficiency: reducing overall demand through energy conservation

Goal: Achieve greater energy security through energy choices

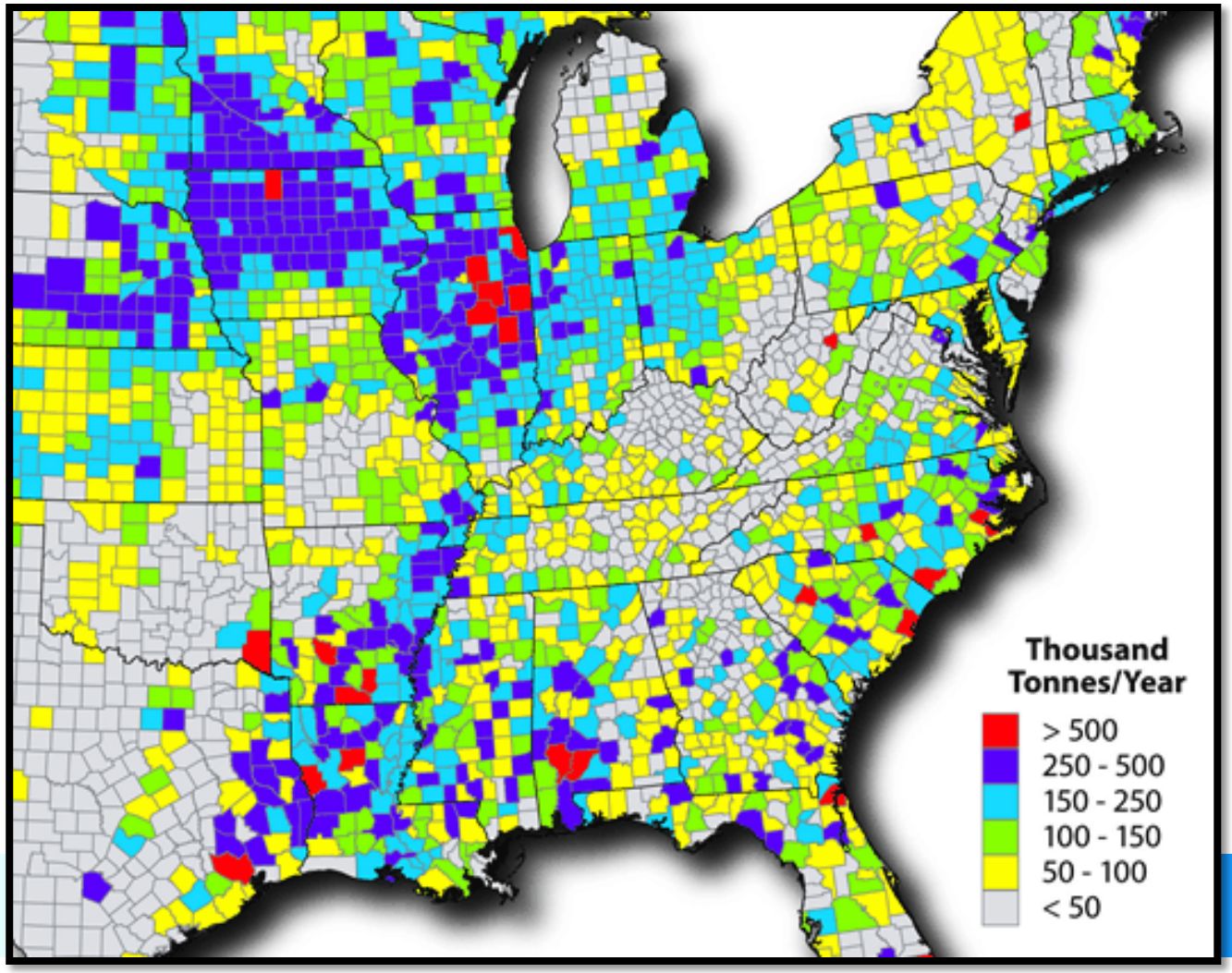
Percentage of Electric Power Generation by Source for Missouri, 1990-2007



Renewable Resource Potential: Biomass and Biofuels

Biomass Potential by County (Thousand Tonnes/Year)

Source: NREL

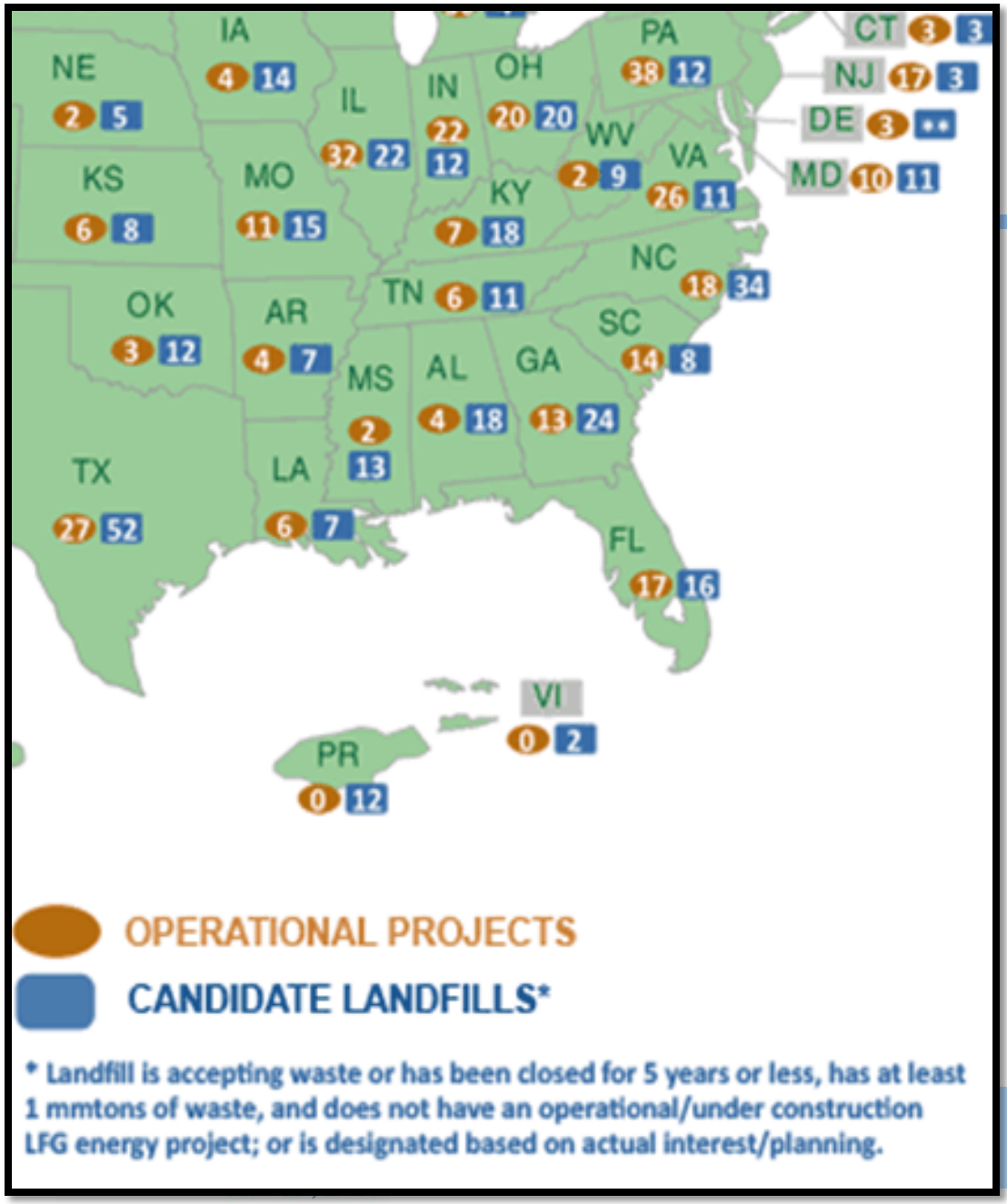


Biomass Resources in Missouri

The University of Missouri and the MDNR study of the potential biomass feedstocks reported that the state had aproximately:

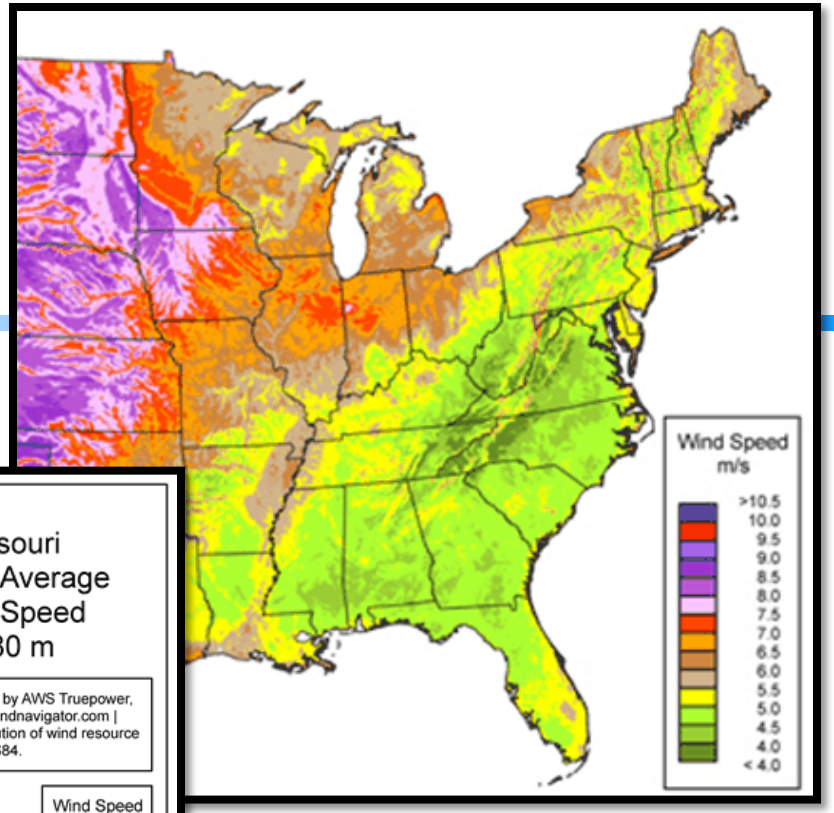
- **8 million tons of dry crop residue from corn per year**
- **2.2 million tons of dry residue from winter wheat**
- **5 million tons of dry residue from soybeans**
- **800,000 tons of dry residue from grain sorghum**
- **600,000 tons of waste from cotton gins and cotton crops**
- **1 million tons of timber harvest residue and 2 million tons of mill residues**

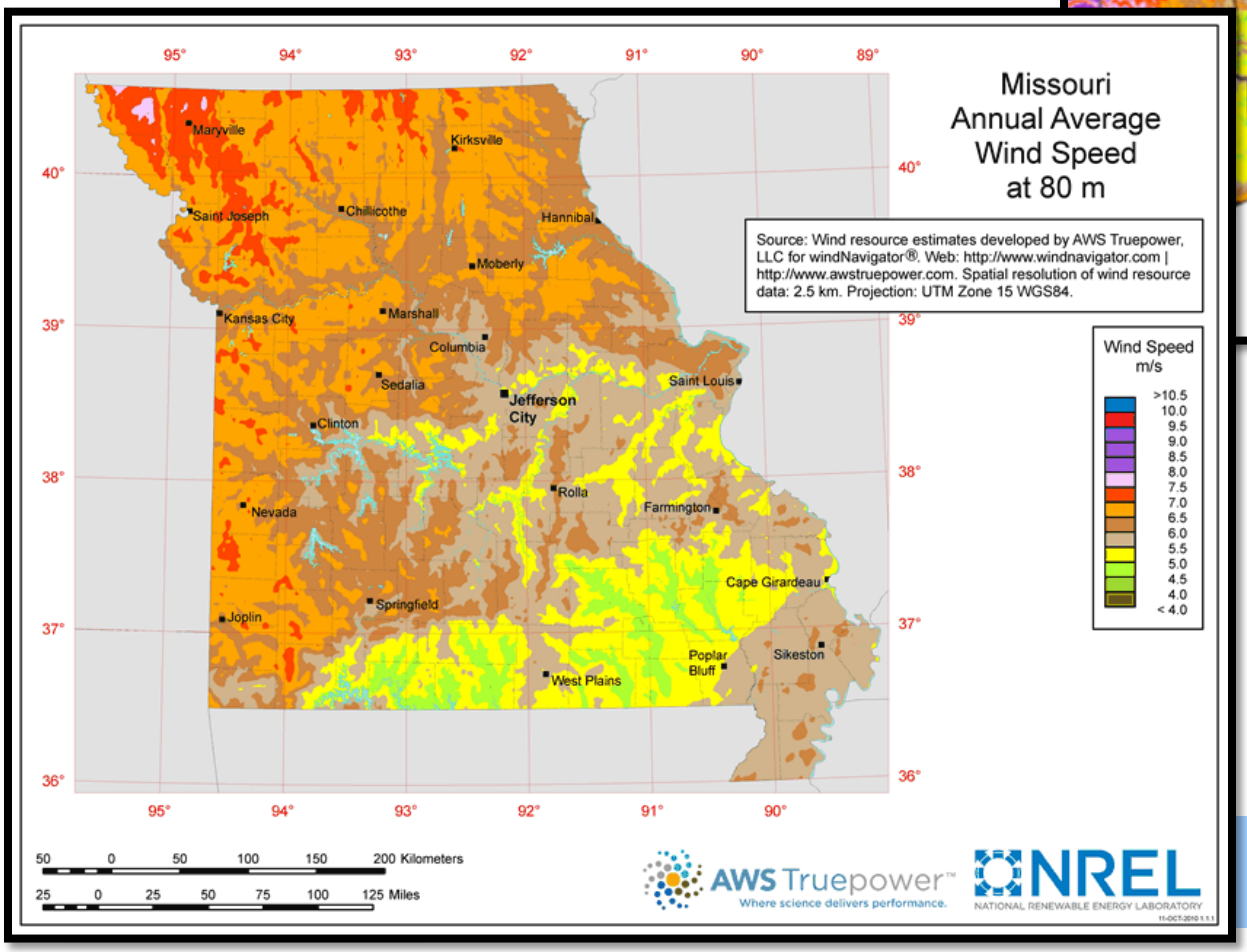
Additional Considerations



- Landfill Gas to Energy (LFG)
- Combined heat and power (CHP)
- Biodigesters

Wind Resources





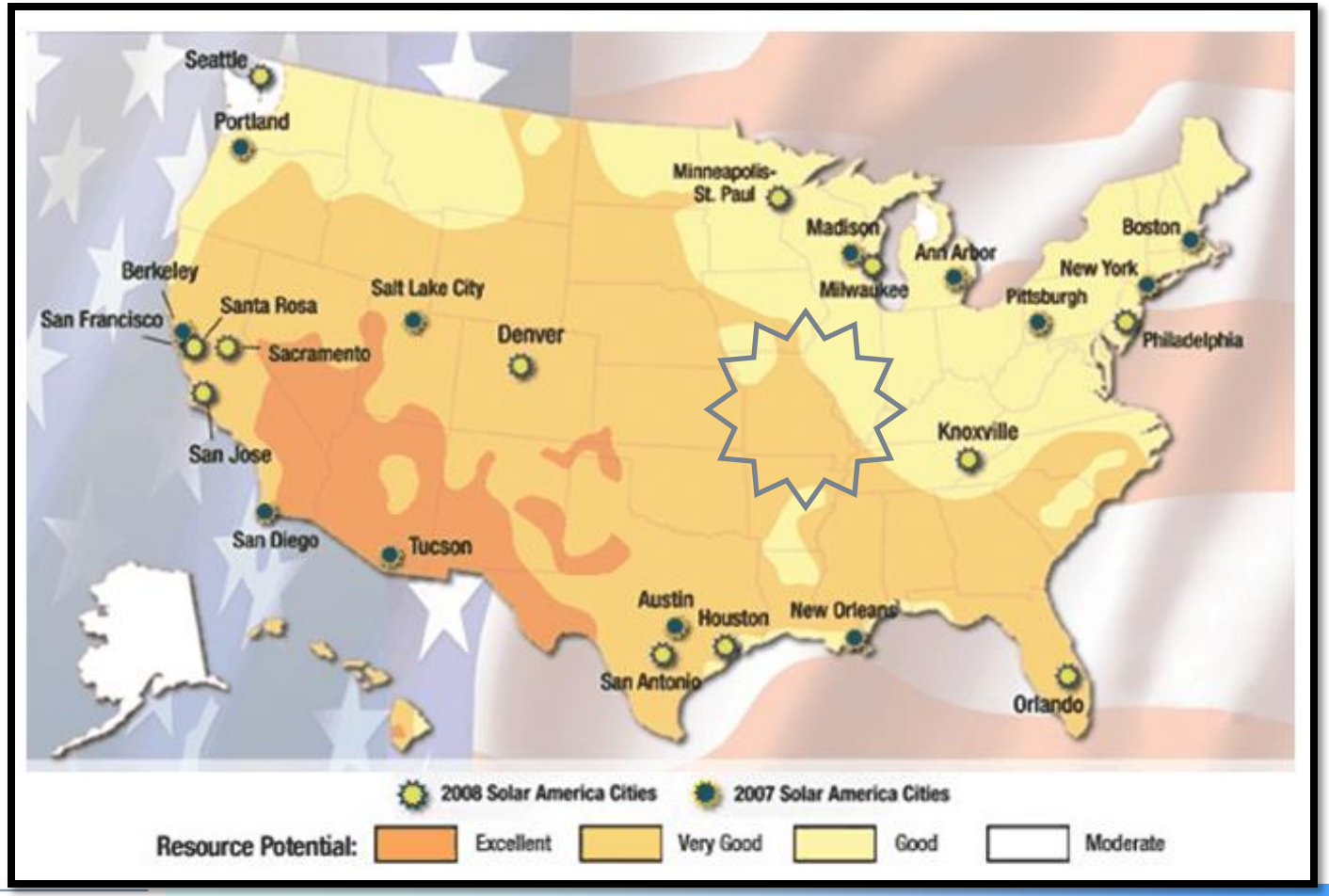
Wind Resources

- **Significant Potential.** Wind resource potential in MO at 80m is 275,000 MW –nine times the state's current electricity needs. Missouri's wind resource is ranked *13th in the nation*.
- **Proximity** to Kansas City and St. Louis, decreasing the cost for transmission lines= more cost effective development
- **Proven Technology.** 450+ MW now online (with 2000+ MW in the queue) Iowa leads nation; total capacity of 2790 MW
  - Rockport, MO was the nation's 1st 100% wind-powered community
- **Economic Impact.**
  - Total direct and indirect jobs supported in 2010: 500-1,000
  - Annual property taxes paid by wind project owners: >$2.5 million
  - Annual land lease payments: >$1.3 million

Top Six Missouri Counties with Commercial Grade Wind density

County	Square Miles of Wind dense Areas
Nordaway	250
Atchison	200
Clinton	175
Putnam	150
Dekalb	150
Holt	150

Solar Resources



Additional Considerations

- Hydropower
  - E.g., In-line turbines at drinking water treatment facilities
- Geothermal
  - Especially suitable in rural areas with low building density and lower installation costs

Key Issues and Opportunities

- Resource availability & quality is only *part* of the picture
  - Policy, technical expertise and assistance, funding, and institutional support can be as important as resource potential
- Barriers to renewable energy deployment in MO include:
  - Very low cost of traditional "brown power"
  - Limited interconnection/net metering opportunities
  - Other?
- What role should the DNR Division of Energy play with regard to renewable energy in MO? (technical assistance programs, funding support, etc.)

Examples of Efforts in Other Regions

- Policy and/or programmatic support (RES, tax credits)

- Direct technical assistance programs and/or technical assistance funding (OR,CA,KS,PA, MS)
- Technical trainings, workshops, etc.
- Demonstration projects (wind for schools)
- Tools, templates and best practices
- Information clearinghouses
- Collaborative partnerships (state lands, brownfields)