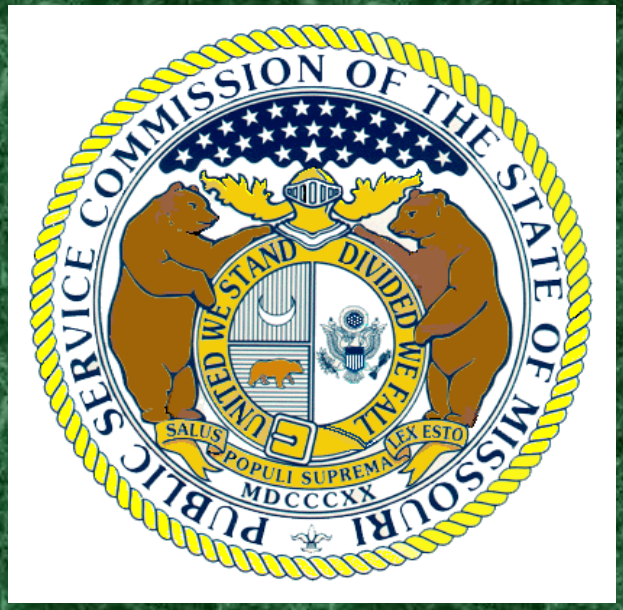
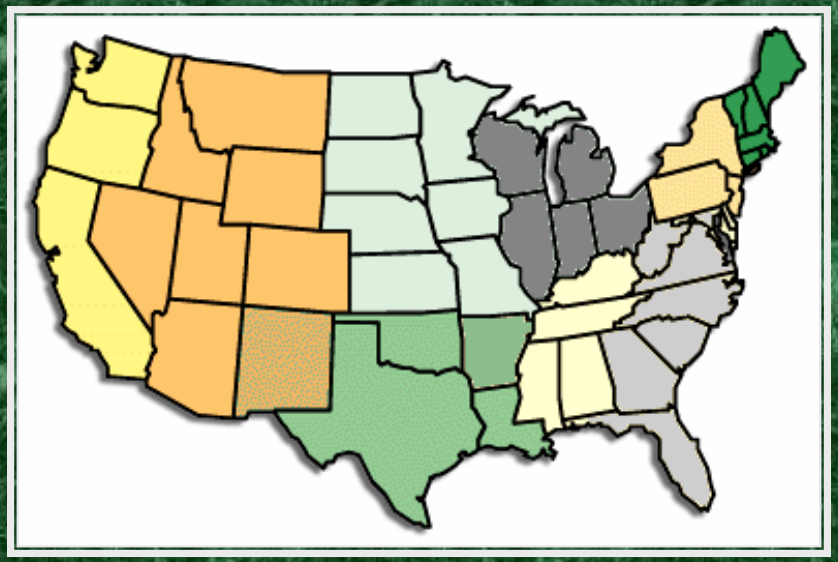
A Renewable Portfolio Standard for Missouri's Electric Utilities: Current Generation Resources, Capacity and Energy Growth Trends & Impacts



High, Low, & Average Residential Electric Rates Per kWh U.S. Census Regions November 2004

Census Region	Low	High	Avg.
Pacific Contiguous	6.31¢	11.97¢	9.86¢
Mountain	6.03¢	10.40¢	8.04¢
West South Central	7.12¢	9.28¢	8.62¢
West North Central	6.65¢	8.75¢	7.40¢
East North Central	7.89¢	9.07¢	8.41¢
East South Central	6.51¢	8.12¢	7.28¢
South Atlantic	6.46¢	9.07¢	8.47¢
Middle Atlantic	9.67¢	15.07¢	11.78¢
New England	10.66¢	13.46¢	11.91¢



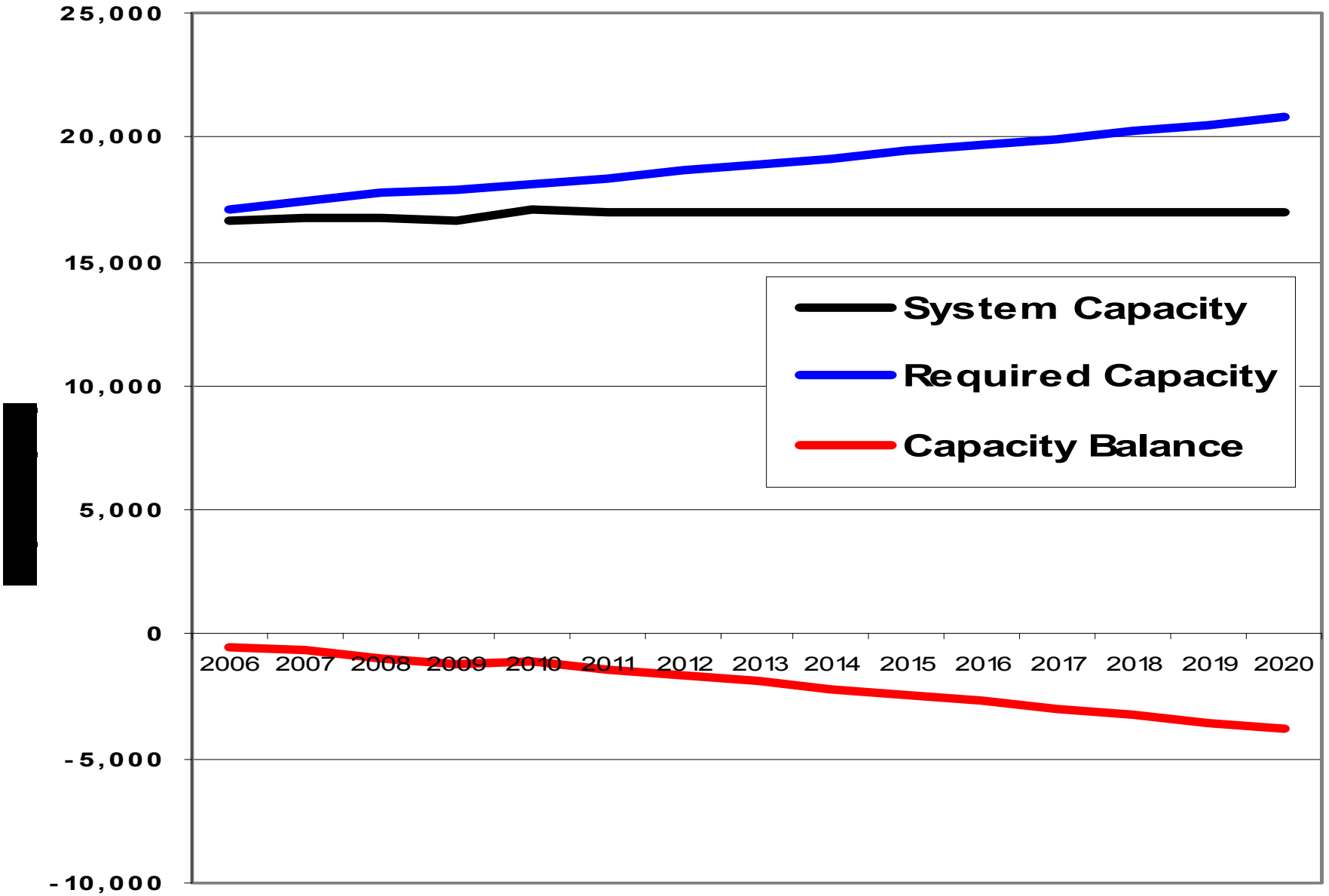
Missouri Residential Rate	6.65¢
U.S. Average Residential Rate	8.96¢
# of states with lower Residential rate	4
# of states with higher Residential rate	46

Electricity: Usage Outlook

- By 2010, the Missouri PSC staff projects that the state will need more than 1,000 MW of additional generation resources and/or purchased power contracts.
- Assuming 1.5% growth on a capacity of 16,000 MW, we'll have to add the capacity of a plant the size of Callaway every five years or so to meet new demand.

- **Conclusion: More generation/conservation!**

Missouri IOU Capacity Needs 2006 to 2020



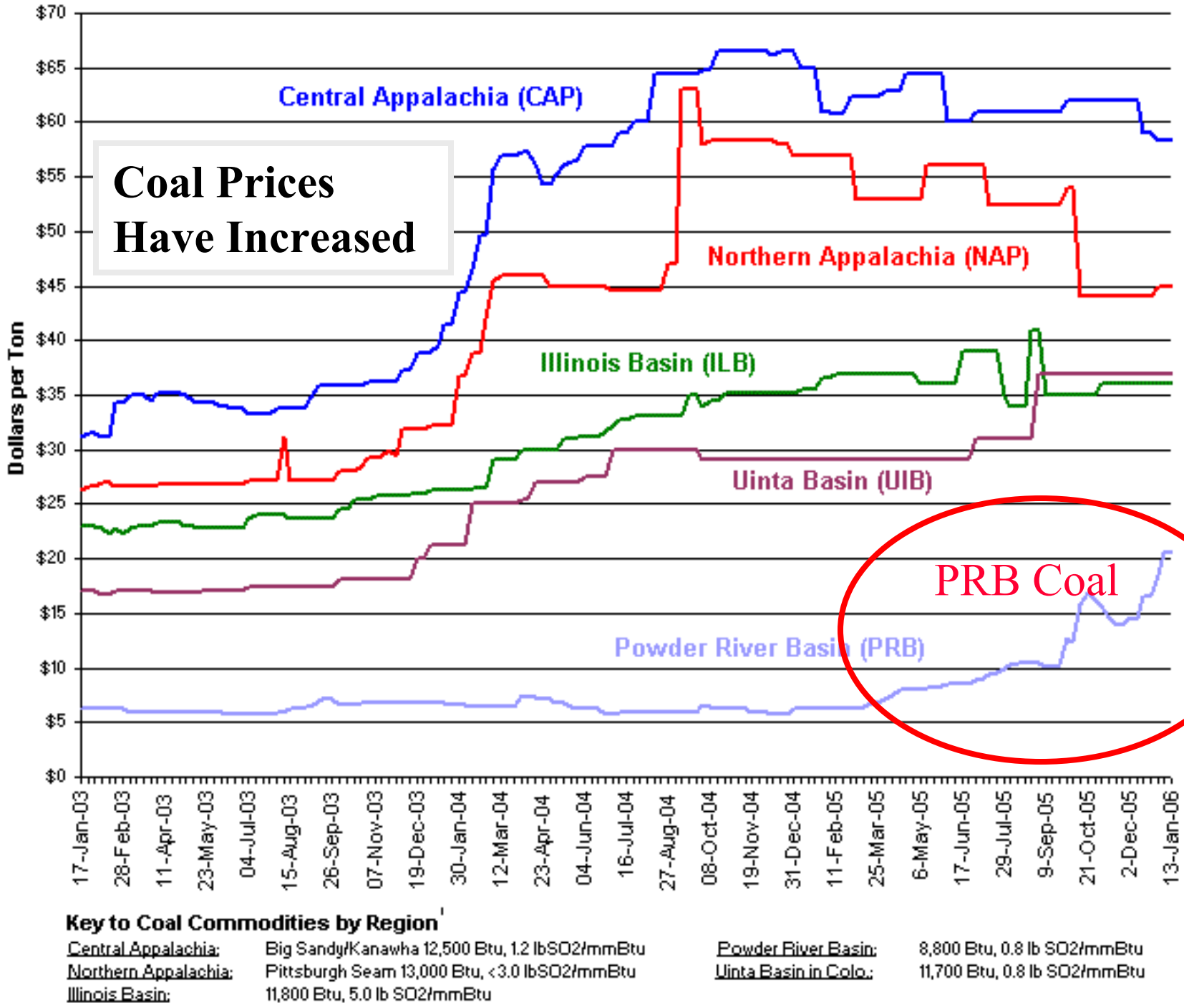
Future Power Options: Gas-Fired Generation

- Natural gas fired plants are relatively cheap to build and have fewer environmental problems, but a volatile fuel market makes them expensive to operate:
  - Construction costs average less than $500/kW.
  - Expect natural gas to stay in the $6.00 - $9.00 per MMBtu range, but several uncertainties could impact this price significantly and cause it to go much higher.
  - Natural gas is more efficient for heating purposes than generating electricity.

Natural Gas Market Prices

Future Power Options: Coal-Fired Generation

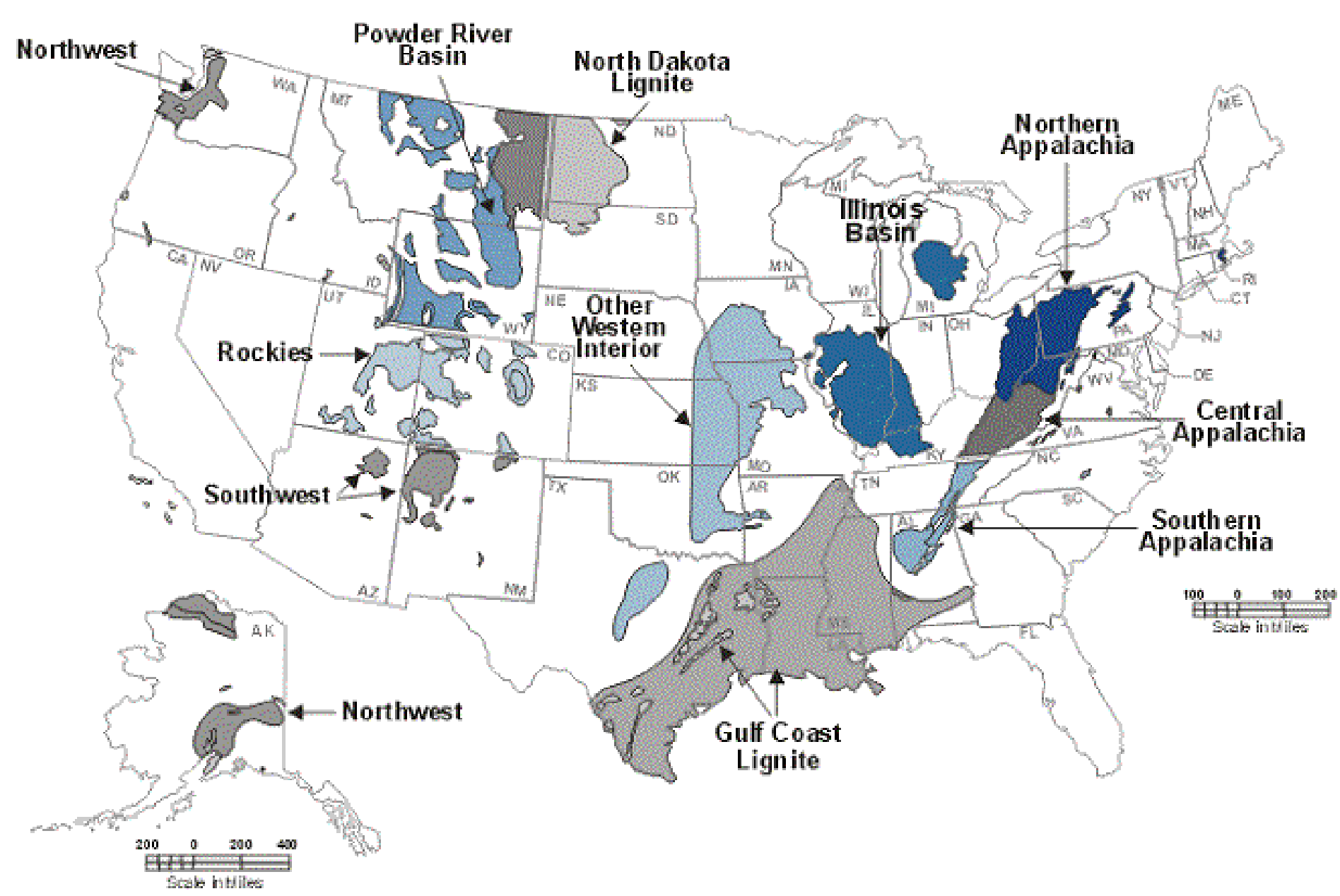
- If you're going to operate a power plant a high percentage of the time, coal-fired electricity may be cheaper than gas-fired electricity or purchased electricity.
  - Construction costs estimated to be $1,300 to $1,800/kW (depending on size of unit and assuming few problems with site or permits).
  - Coal costs have increased to over $20/ton delivered (PRB - over $1/MMBtu).
  - Coal transportation costs have also increased.



Key to Coal Commodities by Region

Central Appalachia:	Big Sandy/Kanawha 12,500 Btu, 1.2 lbSO2/mmBtu	Powder River Basin:	8,800 Btu, 0.8 lb SO2/mmBtu
Northern Appalachia:	Pittsburgh Seam 13,000 Btu, <3.0 lbSO2/mmBtu	Uinta Basin in Colo.:	11,700 Btu, 0.8 lb SO2/mmBtu
Illinois Basin:	11,800 Btu, 5.0 lb SO2/mmBtu		

US Coal Supplies



Future Power Options: Nuclear Power

- Nuclear Power: the public is not ready
  - Large upfront construction cost estimated at $1,500-$3,000/kW (including a number of uncertainties and assumes few problems with site location or environmental permits).
  - Liabilities associated with nuclear power and disposal of waste.
  - CO2 emission penalties/taxes in the future could change this situation.

Future Power Options: Renewable Fuel

- There are very limited additional hydroelectric power sites available and permitting would be nearly impossible.
  - Present hydro: Bagnell Dam, Keokuk, Truman Dam, Tablerock Lake, Mark Twain Lake

Future Power Options: Wind

- Wind power can be fairly cheap once the upfront costs are depreciated out and tax credits (if any) are considered; however, capacity from these sources is not always available when you need it and transmission from good wind sites can be a problem.

Advancements in Wind Power

- Early DNR testing at 25 meters yielded approx. 28% capacity factors.
- More recent (tall tower – 60/80 meters) have yielded 40%+ capacity factors in various parts of state.
  - Atchison
  - Kirksville
  - Springfield

Advancements in Wind Power

- Five years ago: 30 meter blades allowed for 650kw turbines
- Today: 40 meter blades and advancements generators allow for 2.5 – 3MW turbines
- Offshore blade (4.5MW and 5.5MW)

A Renewable Portfolio Standard?

- A minimum percentage of capacity and/or energy would come from renewable energy technologies *and conservation*.
- These energy sources are generally cleaner and more sustainable over the long-term.
- Renewables:

  Solar, Wind, Hydroelectric and Biomass (from a broad range of renewable organic materials)

A Renewable Portfolio Standard?

Great Idea!

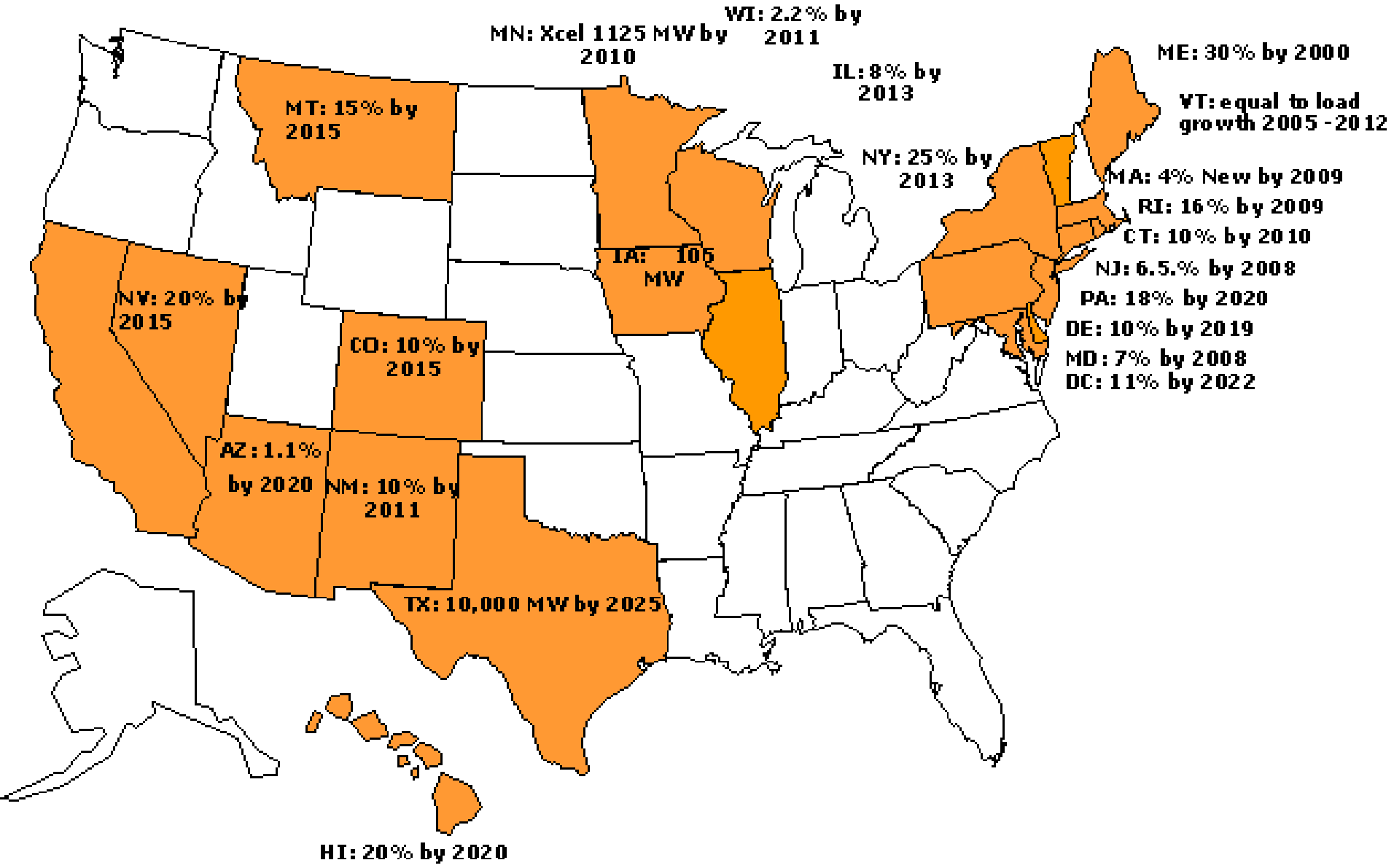
- Could act as a strong incentive to develop in-state energy technologies like biomass, wind and solar.
- Could act as a strong incentive to build more small scale distributed generation.
- Could act as a strong incentive to develop meaningful conservation programs.
- Improving conservation efforts could help us keep rates low and maintain reliability.

A Renewable Portfolio Standard?

On the Other Hand…

- Could result in non-economic generation source additions…and higher electric rates.
- Could result in reduced capacity margins and lower system reliability.
- Could provide incentives to implement technologies that have not been thoroughly tested and are not ready for full-scale commercial operation.

States with a Renewable Portfolio Standard

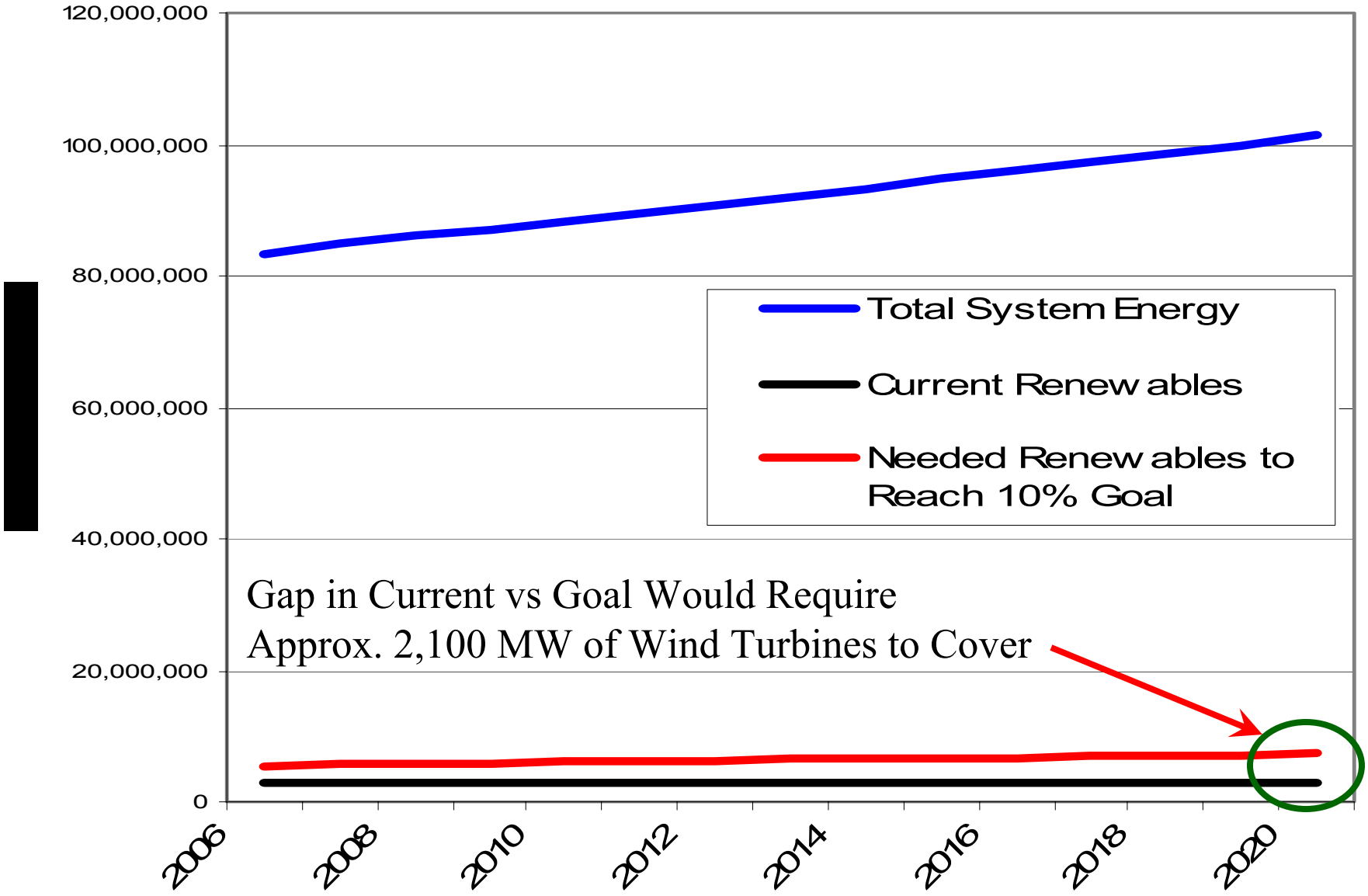


Source: Pew Center on Global Climate Change, Link: http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm

Current Renewables in Missouri

- On an "Energy" basis, a little over 2% of Missouri's electric energy comes from renewable sources (hydroelectric and wind).
- On an equipment nameplate "Capacity" basis, Missouri's utilities receive about 3% of their capacity from renewables.
- In the next year, this capacity number will increase to a little over 4% as a result of some upcoming wind projects.

Missouri IOU Energy & Renewable Levels



Reaching 10% Renewables Goal by 2020

- Currently about 3.4% of the electric energy from Missouri's IOUs comes from renewables.
- This energy generally comes from hydroelectric (55%) and wind (45%).
- The gap in 2020, Missouri would require 1050 MW at 80% capacity or approx 2,100 MW at 40% capacity.
- If coordinated with conservation measures would lower probability of adverse economic impacts.

Missouri's Larger IOUs

- Missouri's larger electric IOUs have lower percentages of their energy from renewables and higher percentages from coal and nuclear based power sources.
- Mandatory minimum percentages (10%) with these utilities would be more likely to cause adverse economic impacts to these companies and their customers.
- These utilities may have better opportunities through green purchase power contracts or from significant conservation efforts in service territories.

Missouri's Smaller IOUs

- Missouri's smaller electric IOUs have higher percentages of their energy from renewables and natural gas and lower percentages from coal and nuclear based power sources.
- Mandatory minimum percentages (10%) with these utilities would be less likely to cause adverse economic impacts.
- These utilities may have better opportunities to implement significant wind, solar and biomass energy sources into their portfolios.

SB 915

- If passed, first broad policy statement on renewable power generation in Missouri
- Target, not a mandate
- Identifies eligible renewable technologies
- 7% by 2015 and 10% by 2020
- Requires inclusion of renewables in IOU's integrated resource planning
- Biennial reporting of progress to General Assembly

QUESTIONS?