

**ENERGY USE AND ENERGY  
EFFICIENCY POTENTIAL FOR  
MIDWEST MANUFACTURING**

*Midwest Industrial Energy Efficiency Summit*

*Chicago, IL*

*January 11, 2012*

**James Bradbury & Nate Aden**

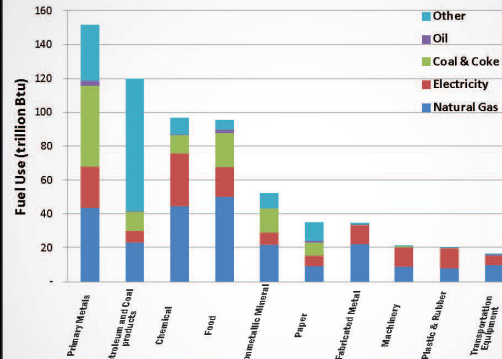
**World Resources Institute**

- Introduction to WRI program
  - Industrial Energy Efficiency
- Regional Manufacturing
  - Importance of manufacturing to state GDP
  - Current energy-use, by state and sector
- Preliminary assessment of EE potential
  - Based on national-level studies

# Manufacturing Summary ILLINOIS

## FUEL USE BY ILLINOIS MANUFACTURING, 2006

In 2006 Illinois manufacturing consumed 680 trillion Btu of energy for fuel use—second only to Ohio in the Midwest. Natural gas is the most-consumed fuel for Illinois manufacturing. Primary metals manufacturing and petroleum and coal products manufacturing accounted for 40% of Illinois manufacturing fuel use in 2006.



## INDUSTRY PURCHASED ENERGY PRICES (2009, 2010)

Energy prices influence demand and end-use efficiency. Whereas reported Illinois delivered were 27% lower than the national average, electricity was slightly more expensive and natural almost a third more than the national average. Prices vary by end-user and time of use, but 2009 and 2010 prices suggests that industry faces a mixed picture among different fuels.

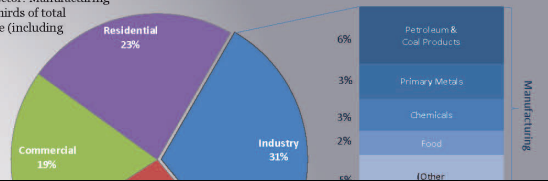
	Electricity (cents/kWh)	Natural Gas (\$/ 1,000 ft <sup>3</sup> )	Coal (\$/short ton)
<b>Illinois</b>	6.82	7.12	47.4
<b>Midwest Average</b>	6.19	6.45	57.4
<b>U.S. Average</b>	6.77	5.39	64.8

**Sources:** Industrial energy price data are from the EIA (2010 data for electricity and natural gas; 2009 data for delivered and fuel use data were estimated based on data from the EIA State Energy Data System, Manufacturing Energy Consumption Survey, and the U.S. Census Bureau Annual Survey of Manufacturers (ASM). Index time series data are from the ASM.

For more information on manufacturing energy use, contact James Bradbury (jbradbury@wri.org) or Nate Aden (naden@wri.org).

## ILLINOIS TOTAL ENERGY USE, 2006

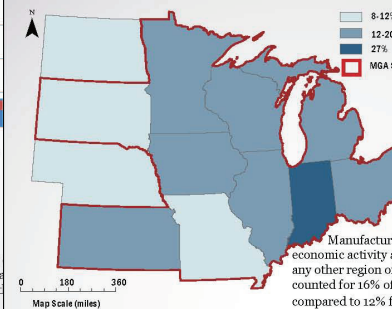
Industry consumes more energy in Illinois than any other end use sector. Manufacturing accounted for two-thirds of total industrial energy use (including feedstocks) in 2006.



# MIDWEST REGION Manufacturing Summary

Manufacturing plays a central role in the economy and energy system of the U.S. Midwest. Declining jobs and volatile energy expenditures have spurred discussions on the future of Midwest manufacturing and the role of public policy in facilitating renewed investment and economic development. This handout summarizes state and regional data on the status of Midwest manufacturing to help inform policy makers, practitioners, and industry stakeholders. This fact sheet is an initial product in the World Resources Institute's ongoing investigation of industry energy efficiency opportunities in the Midwest.

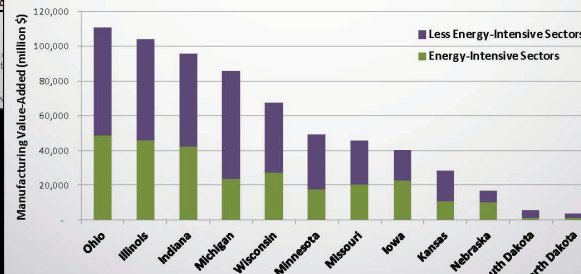
## MANUFACTURING SHARE OF STATE GDP, 2010



Manufacturing plays a larger role in the economic activity and employment of the Midwest than any other region of the U.S. Midwest manufacturing accounted for 16% of regional GDP in 2010, compared to 12% for the U.S. overall.

## MIDWEST VALUE-ADDED OF MANUFACTURING, 2010

Value added is a measure of economic activity. The Midwest census region accounted for 30% of U.S. manufacturing value-added in 2010, compared to 22% of total population. Within the region, Ohio had the highest level of manufacturing activity in 2010. Energy-intensive sectors are of varying importance among Midwestern states, as illustrated by the varying green portions in the bar chart below.

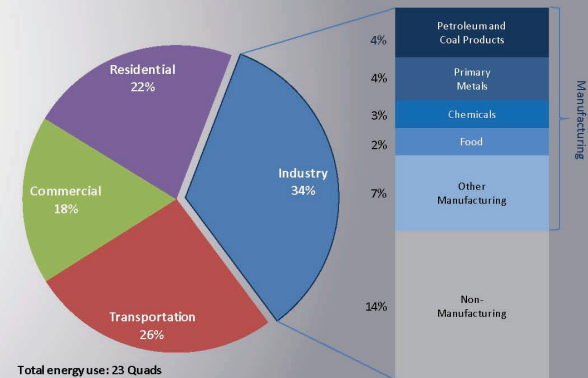


Energy-intensive sectors comprise the seven most energy-intensive sectors at the NAICS 3-digit level; namely: primary metals, petroleum & coal products, chemicals, food, non-metallic minerals, paper, and wood products.

**Sources:** Regional map data are from the U.S. Bureau of Economic Analysis; value-added data are from the U.S. Census Bureau Annual Survey of Manufacturers (ASM); energy use data are from the EIA State Energy Data System, the ASM, and the Manufacturing Energy Consumption Survey.

For more information on manufacturing energy use, contact James Bradbury (jbradbury@wri.org) or Nate Aden (naden@wri.org).

## MIDWEST TOTAL ENERGY USE, 2006



Industry is the largest energy-using sector in the Midwest, followed by the transportation, residential, and commercial sectors. Manufacturing accounted for 60% of 2006 industrial sector fuel and feedstock energy use in the Midwest. The four manufacturing sectors that consumed the most energy were petroleum and coal products, primary metals, chemicals, and food processing.

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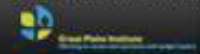


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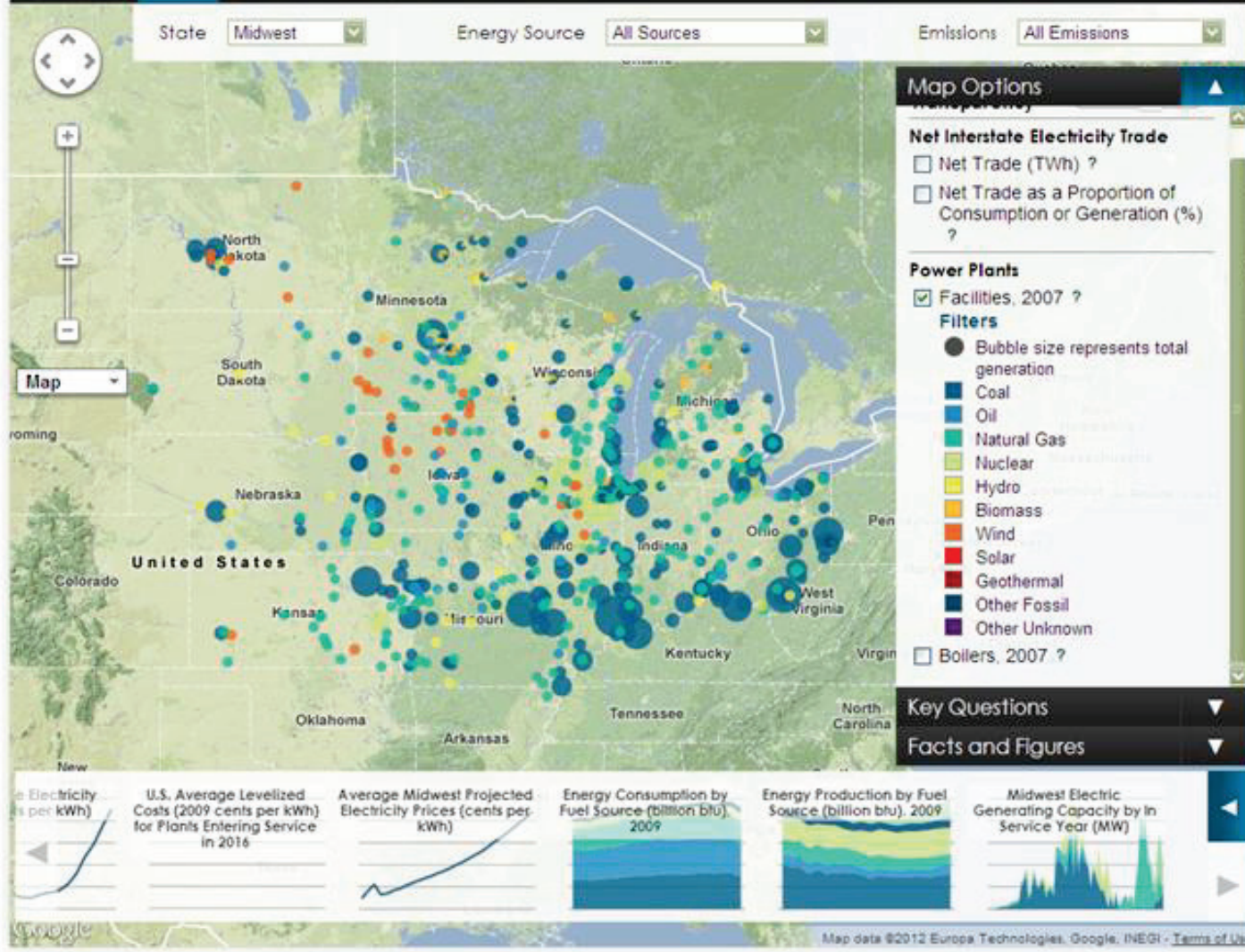
# Power Almanac of the American Midwest



With assistance from:



About **Map** Key Questions References & Data



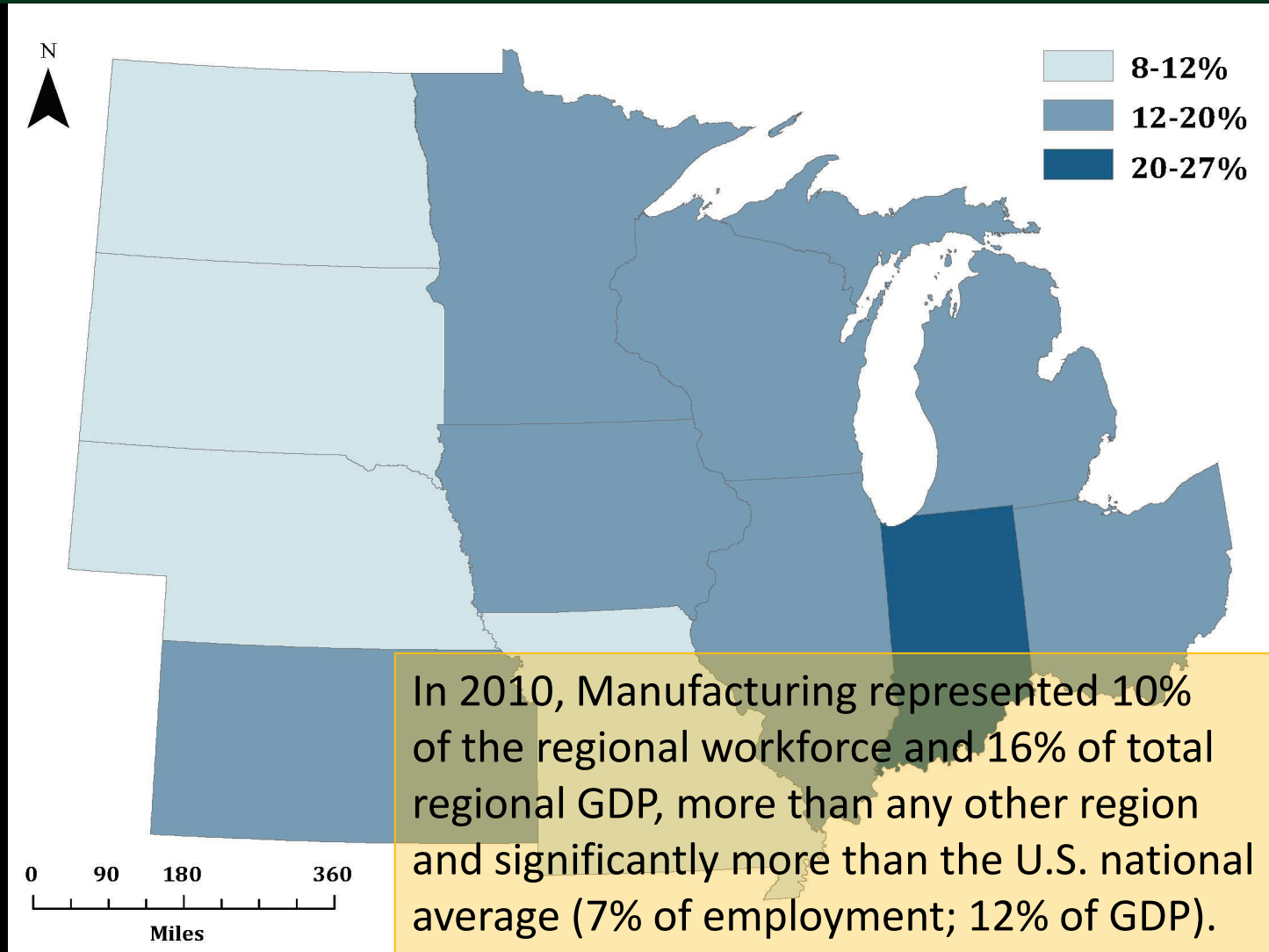
Coming soon (mid February)!!  WORLD RESOURCES INSTITUTE

# KEY POINTS - INDUSTRIAL ENERGY EFFICIENCY

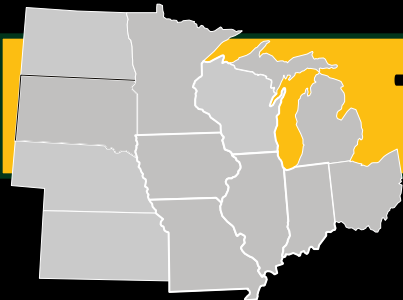
- Midwest economy is uniquely manufacturing-oriented; manufacturing represents a significant portion of total energy-use
- Available data are somewhat limited, but still useful for:
  - Making cross-state comparisons of energy-use and
  - Assessing the scale of opportunities for industrial energy efficiency (EE)
- EE potential for MW manufacturing is up to 25%, more than total energy use by all Illinois manufacturing, combined



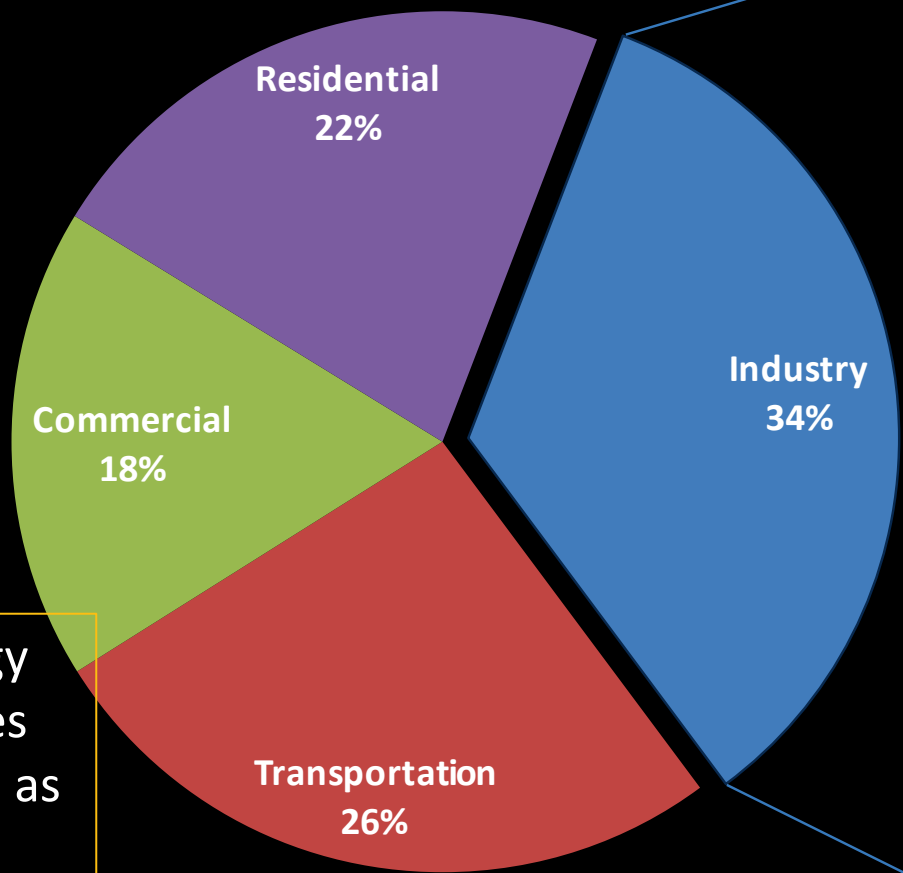
# MANUFACTURING SHARE OF STATE GDP, 2010



# TOTAL MIDWEST ENERGY USE, 2006

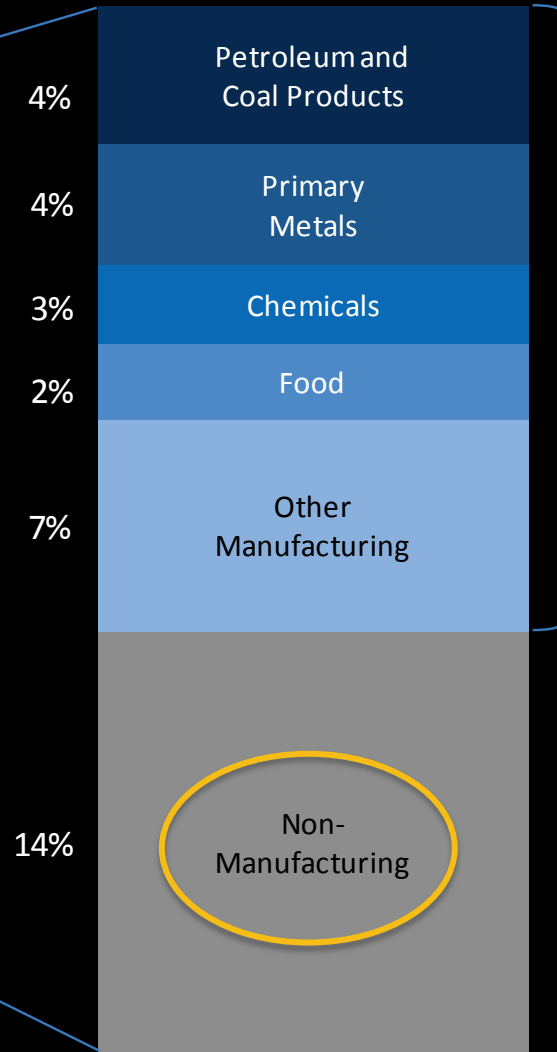


Midwest  
US Census  
Region



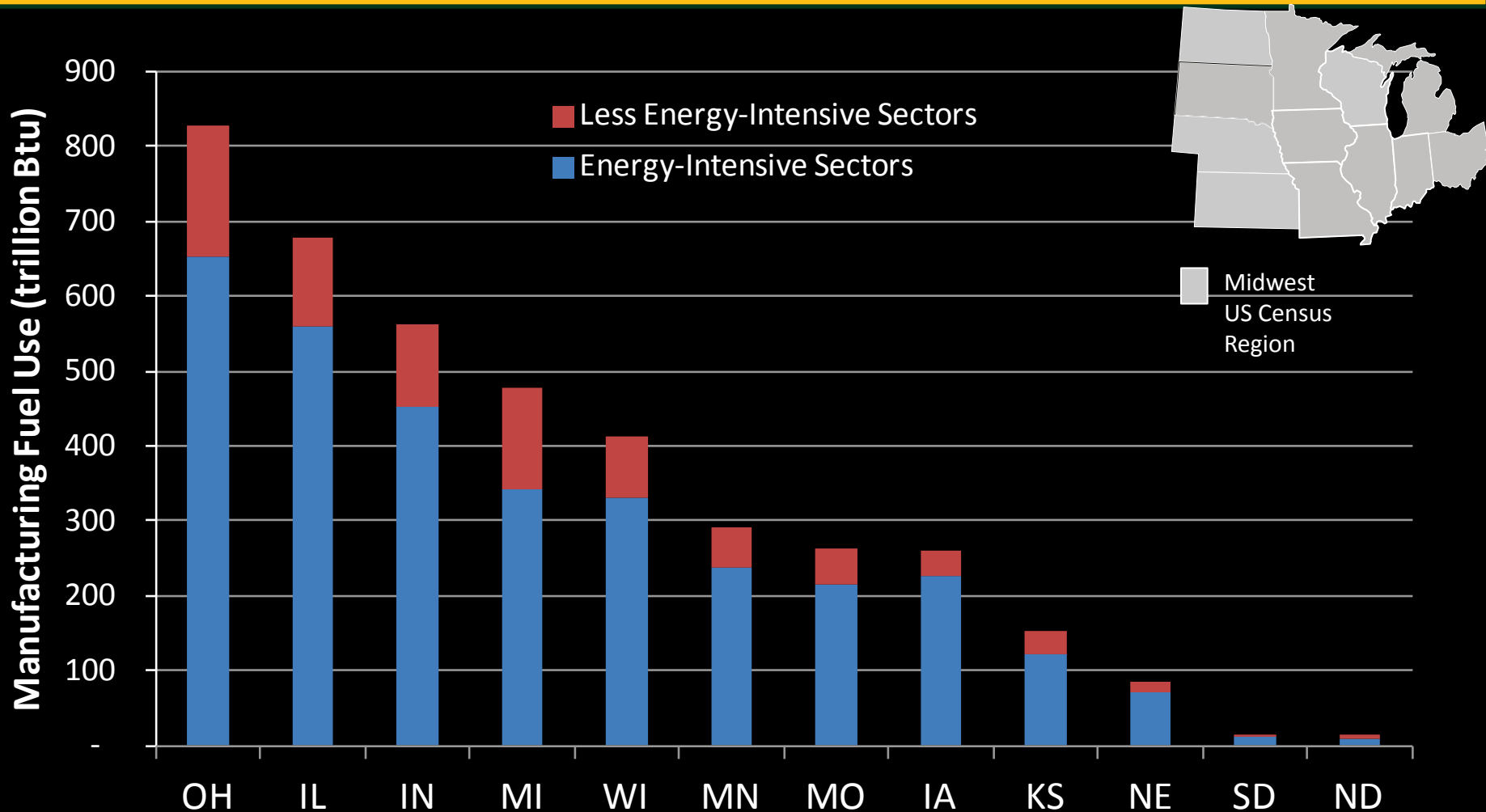
Total energy use: 23 Quads

“Total energy use” includes energy used as a feedstock



Manufacturing = 60% of industry

# MANUFACTURING FUEL USE BY STATE, 2006

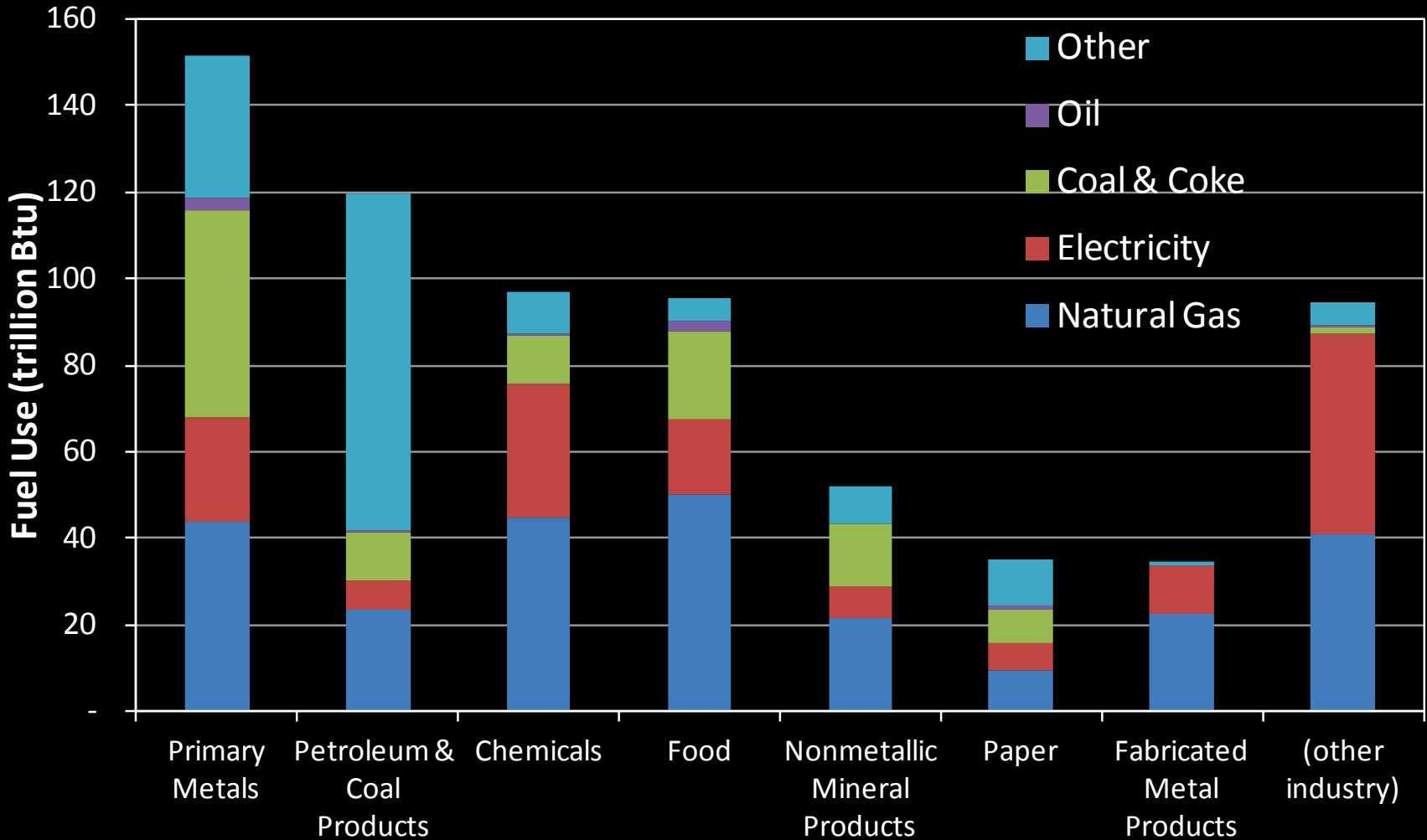


Source: Estimated from U.S. EIA (MECS)  
and U.S. Census (ASM)





# FUEL USE BY ILLINOIS MANUFACTURING, 2006



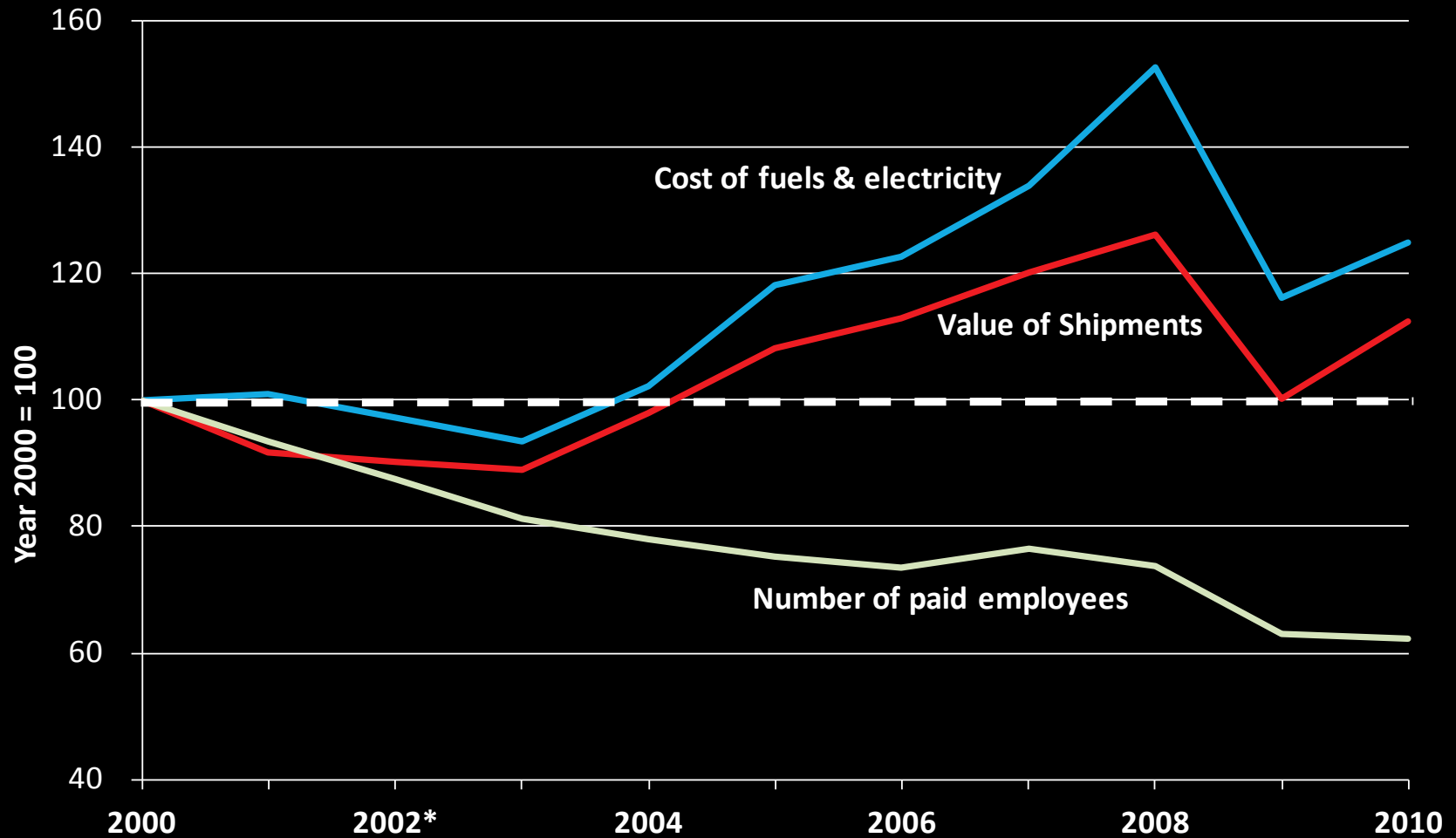
Source: Estimated from U.S. EIA (MECS) and U.S. Census (ASM)



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# INDEX OF MANUFACTURING TRENDS, 2000 - 2010



# COAL, OIL AND BIOMASS-FIRED INDUSTRIAL BOILERS

## Age and Annual Output of U.S. Industrial Boilers

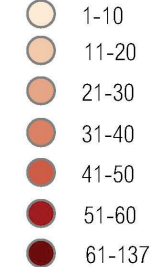
Midwest Region 

Note: 12% of listed boilers are excluded on account of incomplete data; natural gas-fired boilers are also not included in this map.

Annual Energy Output (mmbtu)



Boiler Age (Years)

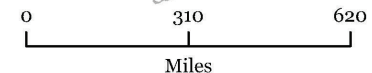


On average, boilers located in the MW are more than 8 years older than the average age of boilers located in the rest of the country



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Source: U.S. EPA, 2011. "Emissions Database for Boilers and Process Heaters Containing Stack Test, CEM, & Fuel Analysis Data Reported Under ICR No. 2286.01 and ICR No. 2286.03 (Version 6).mdb"

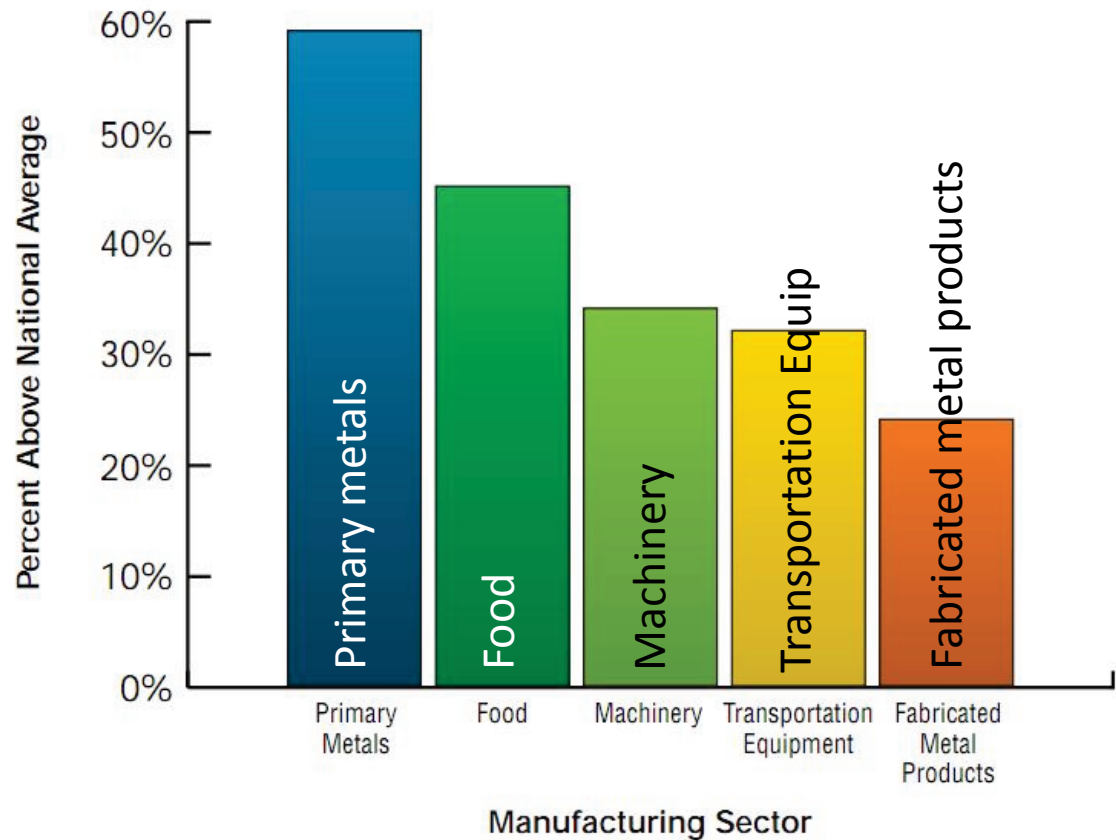


# NATIONAL ENERGY EFFICIENCY POTENTIAL ESTIMATES

- 2009 study by DOE, showing that MW manufacturing is considerably more energy-intensive than the U.S. average for several key regional sectors

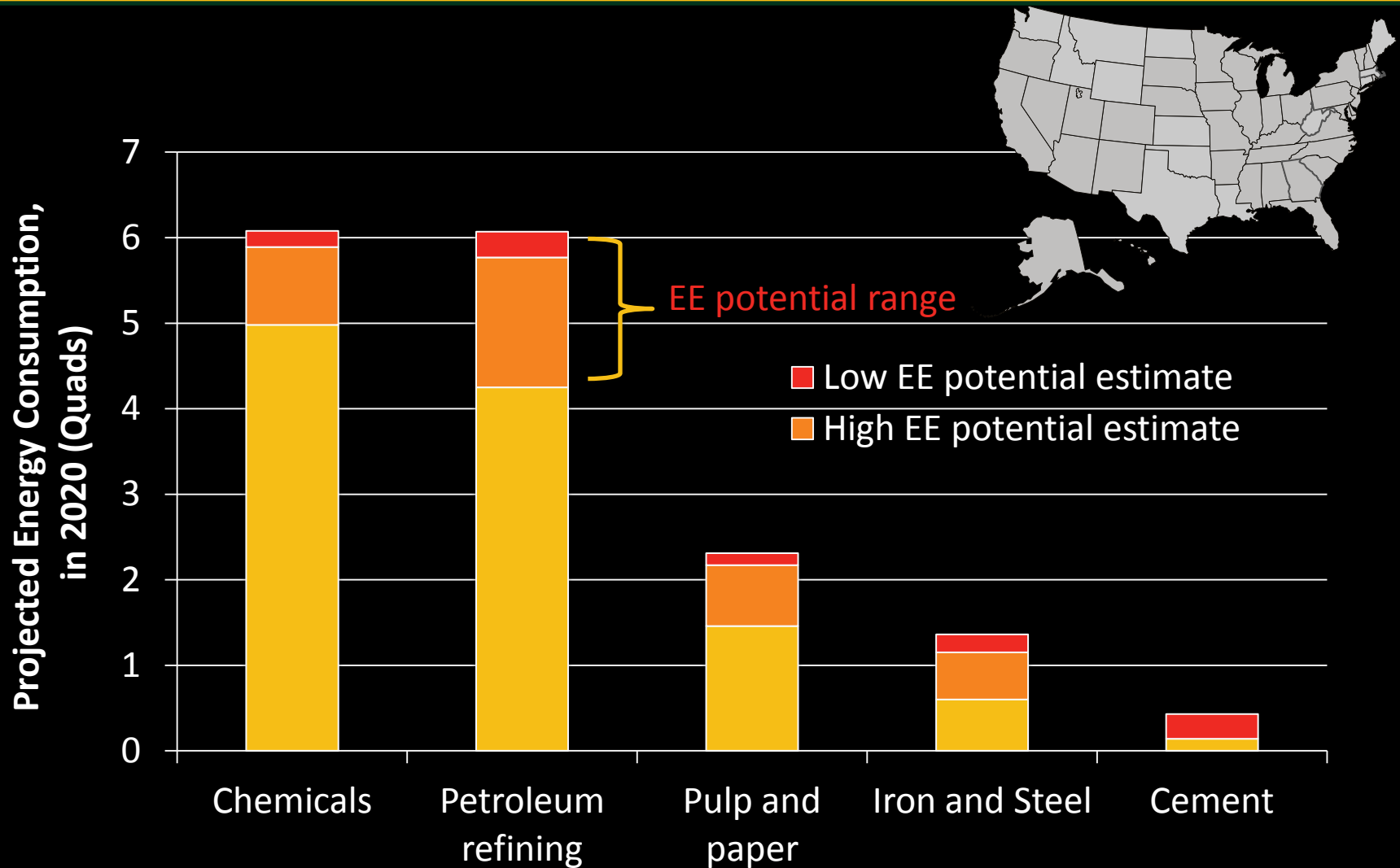
Source: DOE; Glatt et al. (2009)

Exhibit 3: 2006 Midwest Energy Intensity Compared to National Average



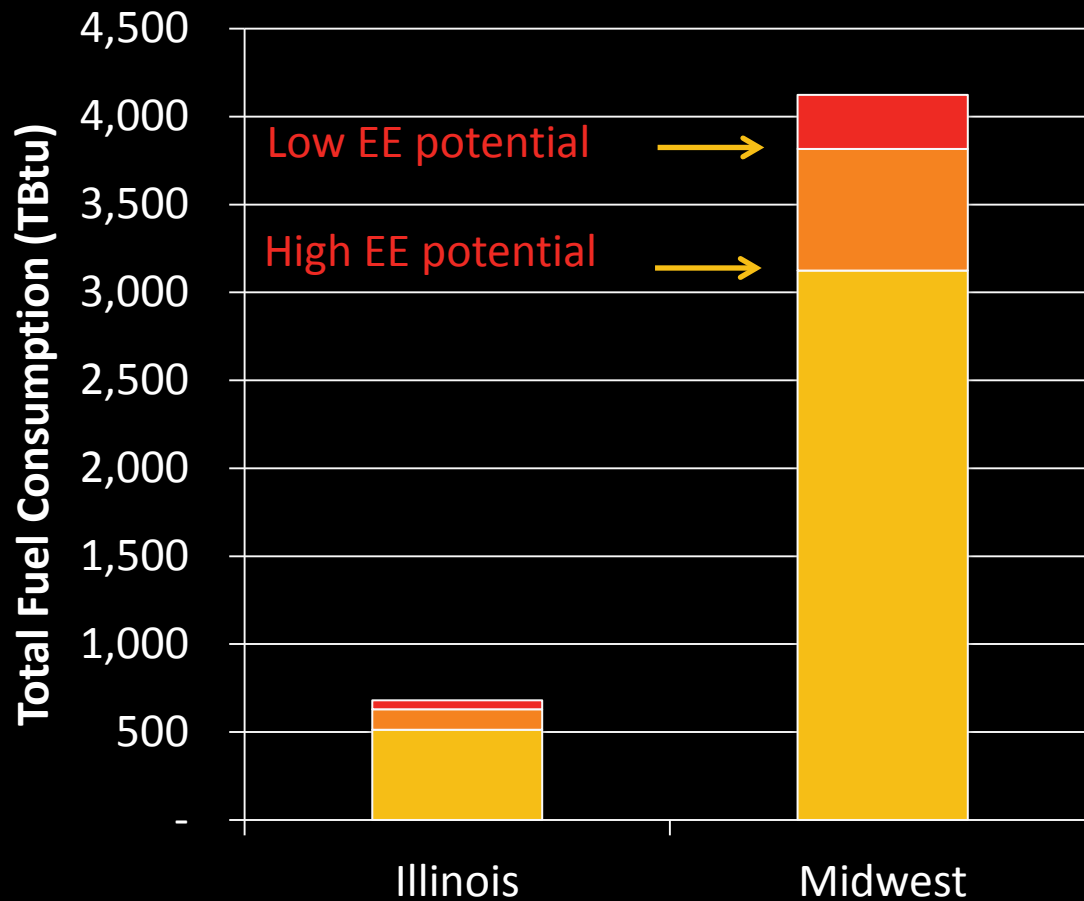
Sources: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. Energy Information Administration, 2006 Manufacturing Energy Consumption Survey, Table 1.2.

# NATIONAL ENERGY EFFICIENCY POTENTIAL ESTIMATES



Source: Adapted from National Academy of Sciences (2010)

# NATIONAL ESTIMATES APPLIED TO REGIONAL AND STATE ENERGY-USE DATA



- Estimated energy savings for MW and IL manufacturing range from 7% to 25%
- In other words, up to:
  - 1 Quad
  - 4% of regional total
  - 1% of national total



# Questions?

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