# Powering the Future:
## A Forecast of Indiana's Electricity Consumption, Prices and Resource Requirements

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*Presented to:*
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# State Utility Forecasting Group

- Executive Order 3-84, which was issued in January 1984 by Indiana's Governor Robert D. Orr, created a special committee designated to address Indiana's utility future. In December 1984, that committee produced a report providing options and specific recommendations.
- The committee recommended four alternatives models for a forecasting system
  - utilities produce their own forecasts independently
  - utilities work together to produce forecasts as a group
  - the Utility Regulatory Commission produces the forecasts
  - another public or quasi-public entity produces the forecasts
- The 4th option was chosen and Purdue was chosen to house the State Utility Forecasting Group.

# Indiana Code 8-1 To 8-5 (Amended in 1985)

*"The commission shall establish a permanent forecasting group to be located at a state-supported college or university within Indiana … This group shall develop and keep current a methodology for forecasting the probable future growth of electricity within Indiana and within this region of the nation."*

# SUFG Forecasts

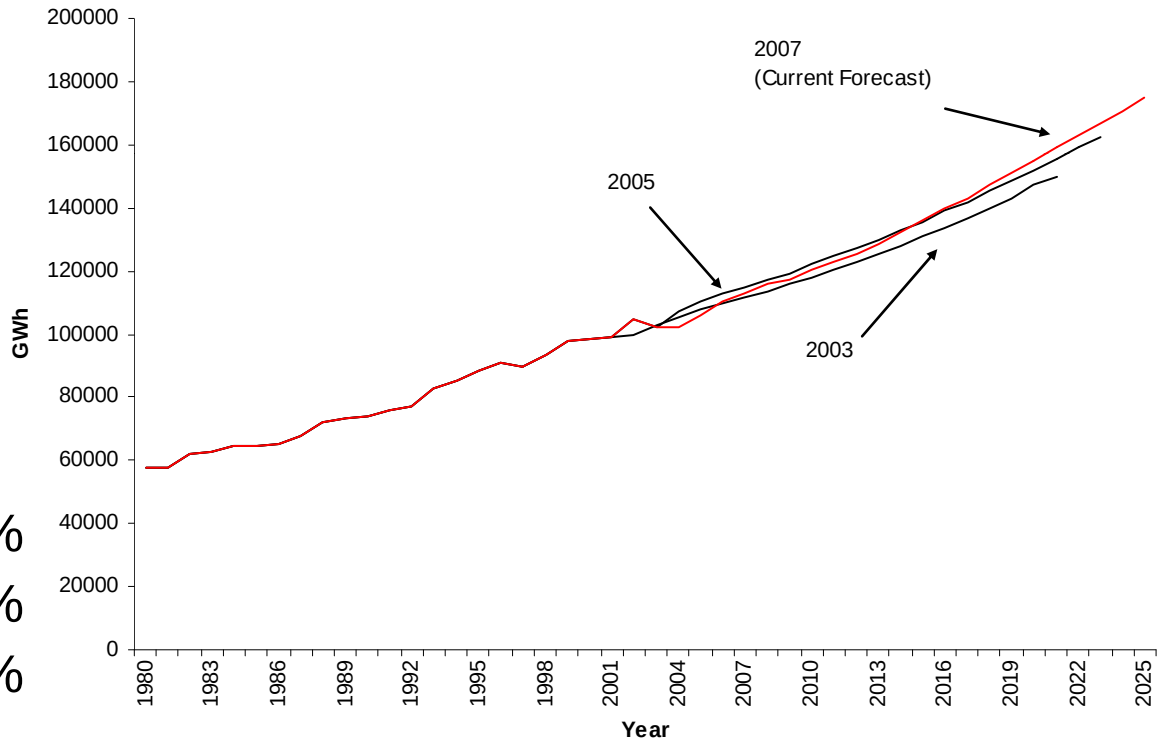
- Roughly every 2 years, SUFG produces a long-term (20 year) set of projections of electricity sales, prices, and resource requirements for Indiana
- Most recent forecast was released in December 2007
- 2009 forecast is in the process of being examined prior to its release

# 2007 Forecast Highlights

- Significant real electricity price increase through 2012, then leveling off
- Electricity requirements and peak demand projections were projected to grow at an average compound rate of 2.46 percent
  - similar to recent historical observations
- Resource requirements were projected to grow an average of 585 MW per year
  - baseload, intermediate, and peaking resources were all indicated as being needed in the future

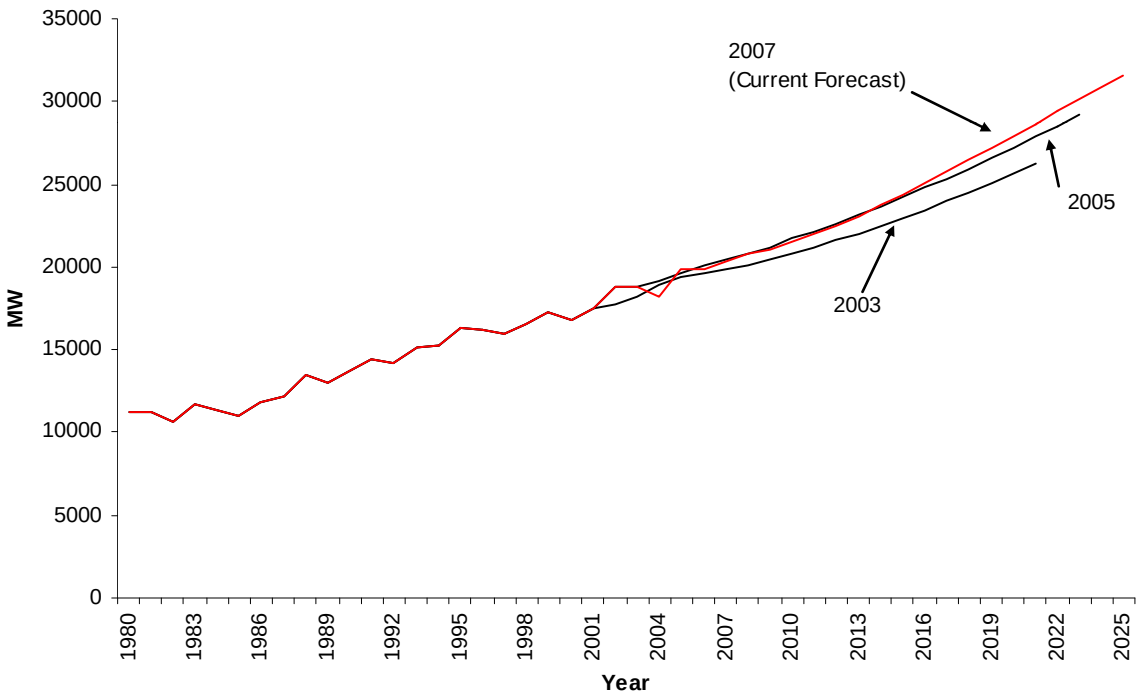
# Indiana Electricity Requirements

- Retail sales by investor owned and not-for-profit utilities
- Includes estimated transmission and distribution losses
- Growth rates
  - 2007 forecast: 2.46%
  - 2005 forecast: 2.22%
  - 2003 forecast: 2.16%



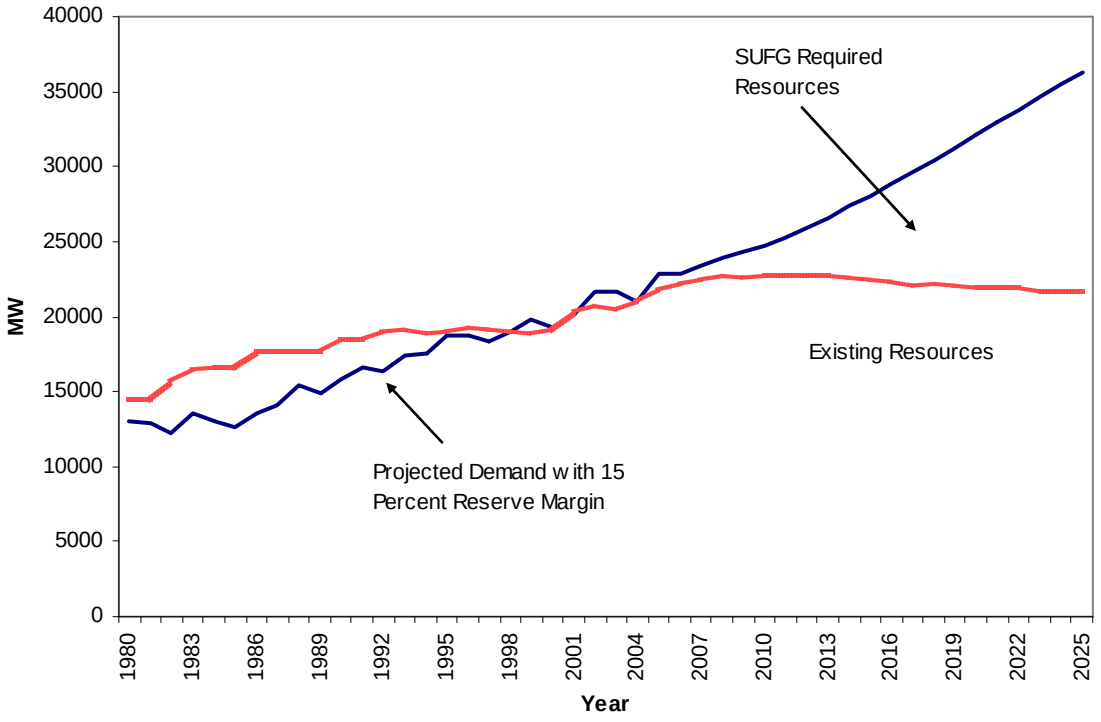
# Indiana Peak Demand Requirements

- Peak demand is net of DSM and interruptible loads
- Growth rates
  - 2007 forecast: 2.46%
  - 2005 forecast: 2.24%
  - 2003 forecast: 2.07%



# Indiana Resource Requirements

- Resources may be provided by conservation measures, contractual purchases, purchases of existing assets, or new construction
- Existing resources are adjusted into the future for retirements, contract expirations, and IURC approved new resources
  - Did not include Duke IGCC, Sugar Creek and Holland natural gas plants, or wind purchases



# Indiana Resource Requirements

| | Uncontrolled Peak Demand [1] | Interruptible | Net Peak Demand [2] | Existing/ Approved Capacity [3] | Incremental Change in Capacity [4] | Projected Additional Resource Requirements [5] | | | | Total Resources [6] | Reserve Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Peaking | Cycling | Baseload | Total | | |
| 2005 | | | | 21,777 | | | | | | | |
| 2006 | 20,933 | 1,059 | 19,874 | 22,166 | 389 | 90 | 530 | 120 | 740 | 22,906 | 15 |
| 2007 | 21,393 | 1,062 | 20,331 | 22,519 | 353 | 140 | 620 | 90 | 850 | 23,369 | 15 |
| 2008 | 21,865 | 1,063 | 20,803 | 22,779 | 260 | 230 | 730 | 170 | 1,130 | 23,909 | 15 |
| 2009 | 22,163 | 1,065 | 21,099 | 22,554 | -225 | 310 | 1,020 | 390 | 1,720 | 24,274 | 15 |
| 2010 | 22,608 | 1,067 | 21,541 | 22,719 | 165 | 330 | 1,100 | 620 | 2,050 | 24,769 | 15 |
| 2011 | 23,077 | 1,068 | 22,010 | 22,738 | 19 | 480 | 1,230 | 880 | 2,590 | 25,328 | 15 |
| 2012 | 23,590 | 1,071 | 22,520 | 22,685 | -53 | 600 | 1,330 | 1,290 | 3,220 | 25,905 | 15 |
| 2013 | 24,177 | 1,073 | 23,104 | 22,685 | 0 | 770 | 1,430 | 1,710 | 3,910 | 26,595 | 15 |
| 2014 | 24,831 | 1,076 | 23,756 | 22,635 | -50 | 1,000 | 1,510 | 2,180 | 4,690 | 27,325 | 15 |
| 2015 | 25,464 | 1,078 | 24,387 | 22,511 | -125 | 1,240 | 1,620 | 2,710 | 5,570 | 28,081 | 15 |
| 2016 | 26,143 | 1,081 | 25,062 | 22,384 | -126 | 1,440 | 1,710 | 3,300 | 6,450 | 28,834 | 15 |
| 2017 | 26,819 | 1,084 | 25,736 | 22,043 | -341 | 1,700 | 2,090 | 3,760 | 7,550 | 29,593 | 15 |
| 2018 | 27,562 | 1,088 | 26,474 | 22,149 | 106 | 1,940 | 2,210 | 4,160 | 8,310 | 30,459 | 15 |
| 2019 | 28,277 | 1,092 | 27,185 | 22,072 | -77 | 2,180 | 2,310 | 4,700 | 9,190 | 31,262 | 15 |
| 2020 | 29,016 | 1,096 | 27,921 | 21,909 | -163 | 2,530 | 2,430 | 5,220 | 10,180 | 32,089 | 15 |
| 2021 | 29,746 | 1,100 | 28,647 | 21,909 | 0 | 2,700 | 2,520 | 5,820 | 11,040 | 32,949 | 15 |
| 2022 | 30,504 | 1,104 | 29,400 | 21,869 | -41 | 2,940 | 2,600 | 6,400 | 11,940 | 33,809 | 15 |
| 2023 | 31,219 | 1,108 | 30,112 | 21,709 | -160 | 3,100 | 2,700 | 7,120 | 12,920 | 34,629 | 15 |
| 2024 | 31,954 | 1,112 | 30,843 | 21,709 | 0 | 3,290 | 2,820 | 7,640 | 13,750 | 35,459 | 15 |
| 2025 | 32,678 | 1,116 | 31,562 | 21,628 | -81 | 3,470 | 2,930 | 8,290 | 14,690 | 36,318 | 15 |

1 Uncontrolled peak demand is the peak demand with DSM in place butwithout any interruptible loads being called upon.

2 Net peak demand is the peak demand after interruptible loads are taken into account.

3 Existing/approved capacity includes installed capacity plus approved new capacity plus firm purchases minus firm sales.

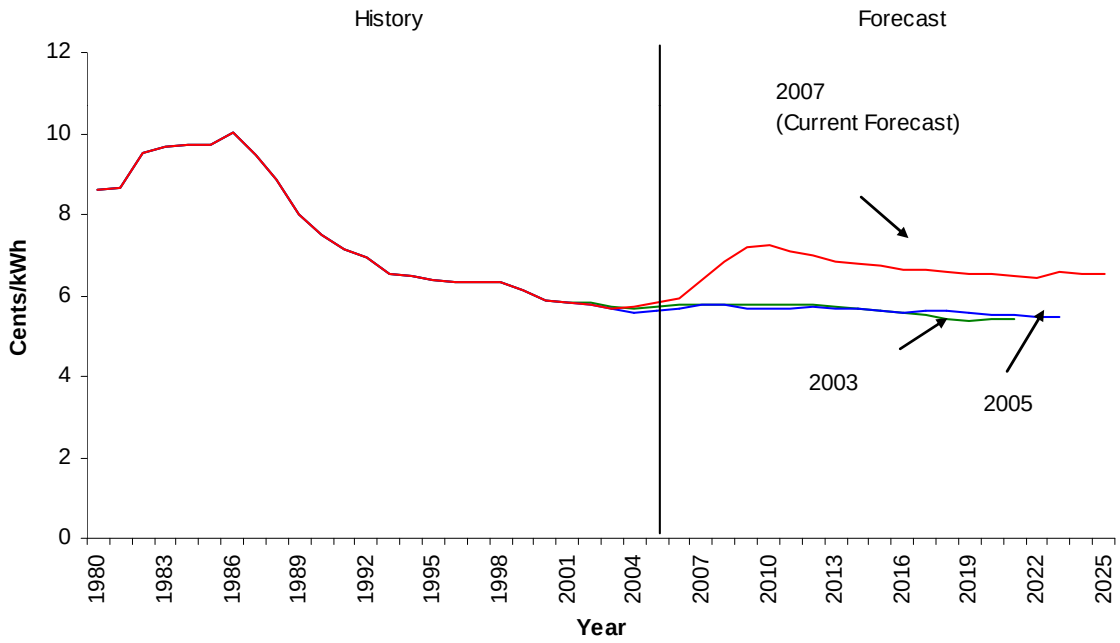
4 Incremental change in capacity is the change in existing/approved capacity from the previous year. The change is due to new, approved capacity becoming operational, retirements of existing capacity, and changes in firm purchases and sales.

5 Projected additional resource requirements is the cumulative amount of additional resources needed to meet future requirements.

6 Total resource requirements are the total statewide resources required including existing/approved capacity and projected additional resource requirements.

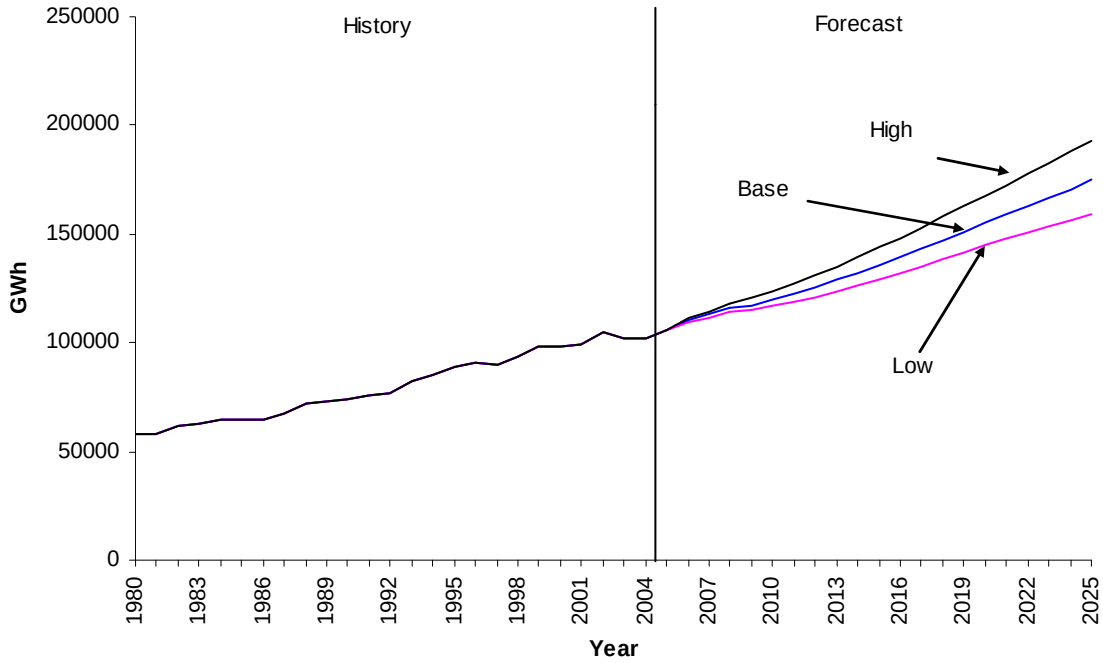
# Indiana Real Price Projections (2005 $)

- Effect of inflation removed
- Included the cost of meeting CAIR and CAMR
- Did not include costs associated with CO2 or RPS
- Included the cost of new resources

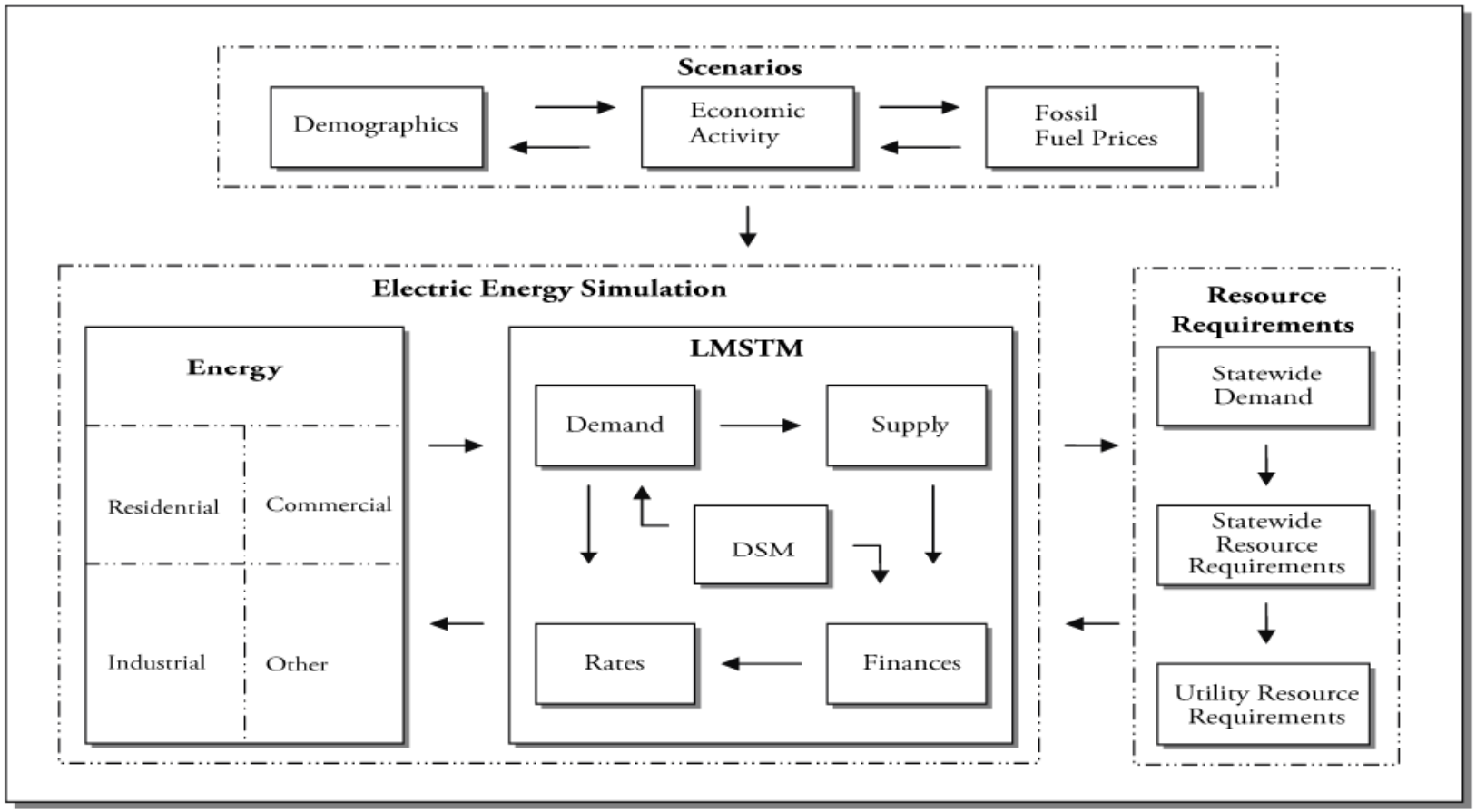


# Alternative Scenarios

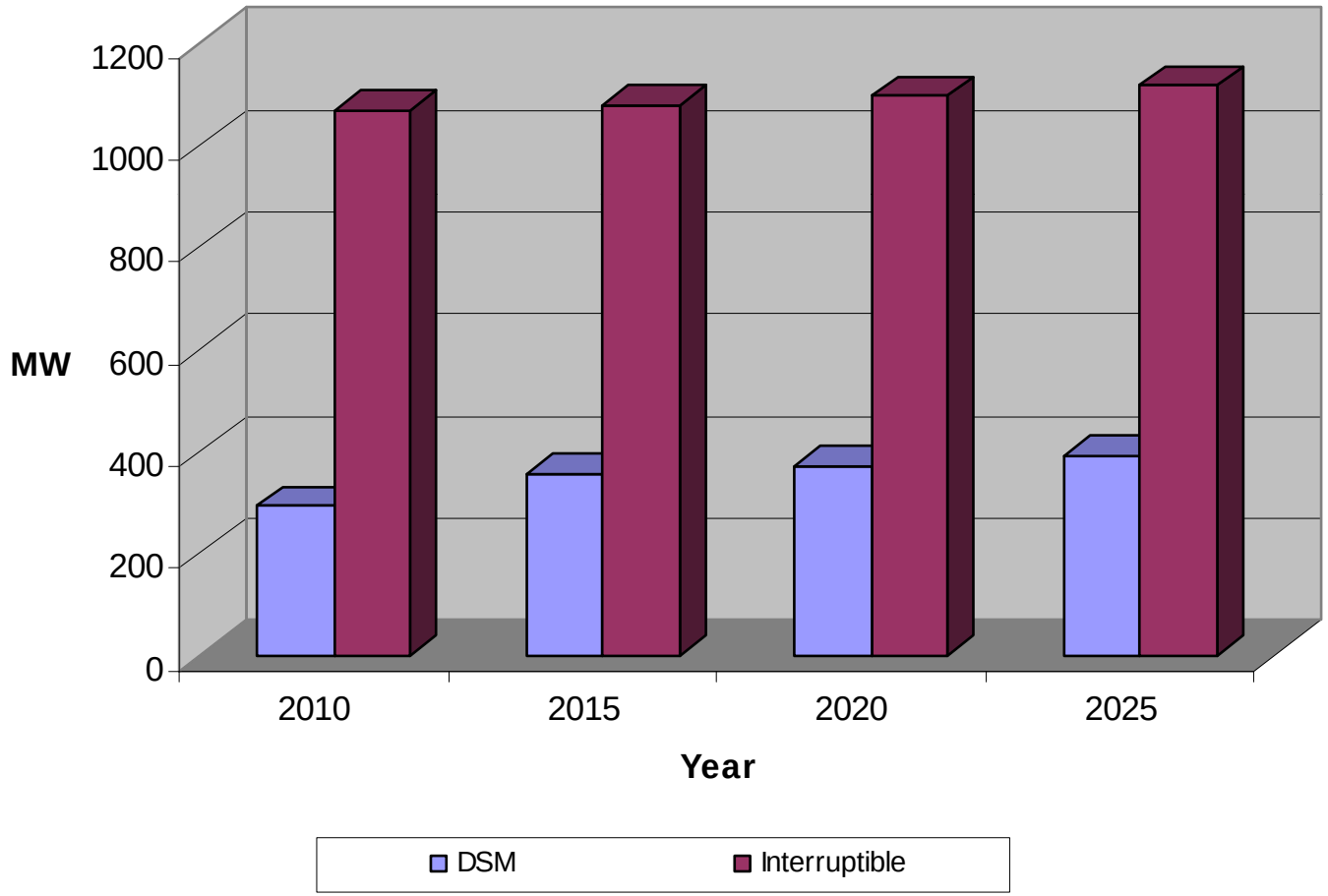
- Any forecast contains uncertainty
- CEMR provides alternative low and high growth econometric forecasts
- Low and high growth scenarios are intended to give a plausible bound to uncertainty



# SUFG's Modeling System



# Incremental DSM and Interruptible Loads



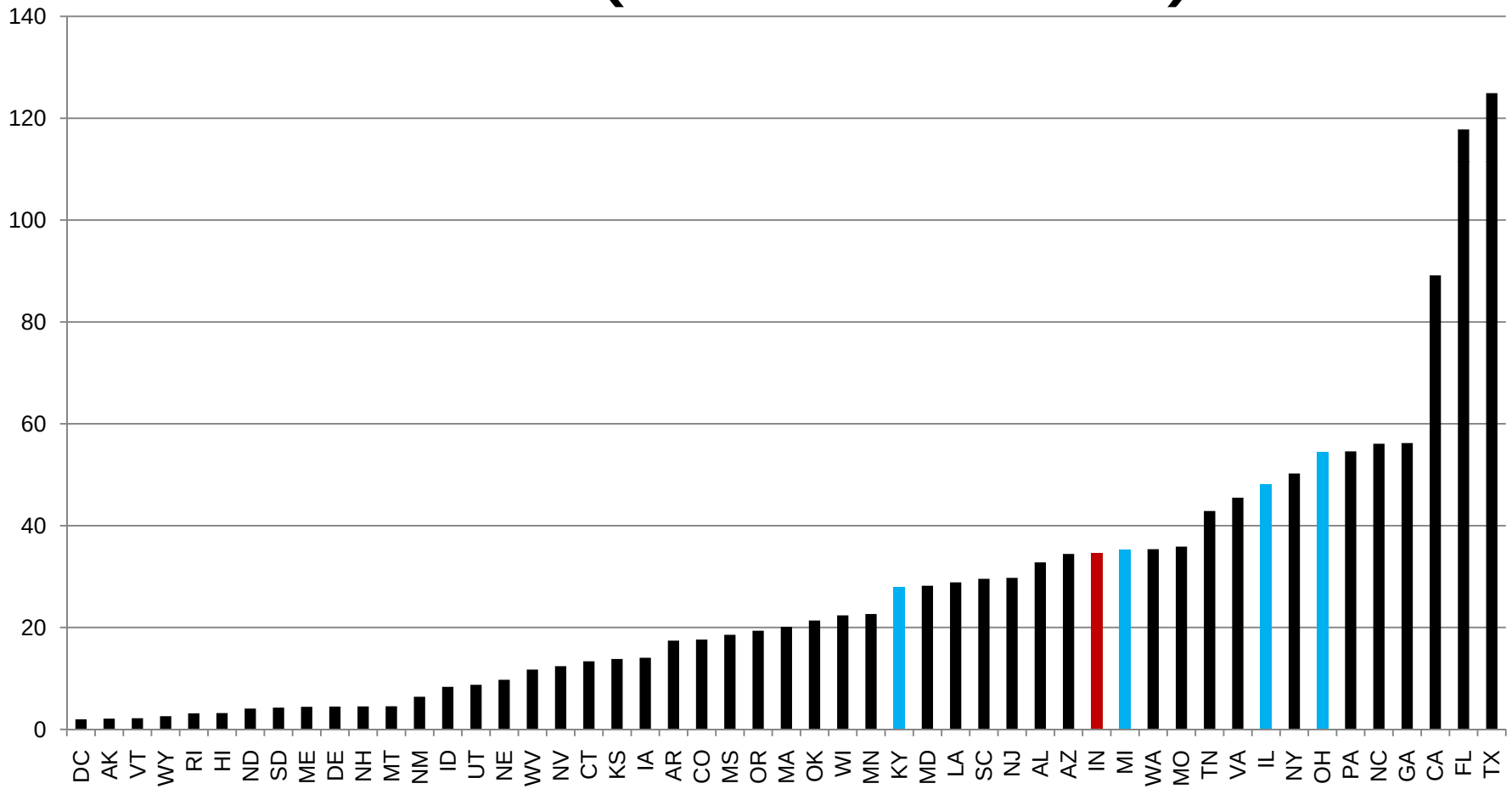
# What has Changed?

- Economy
- New resources added to the state's jurisdictional generation fleet
  - Edwardsport IGCC
  - Sugar Creek NGCC
  - Holland NGCC
  - wind purchase power agreements
- Clean Air Mercury Rule

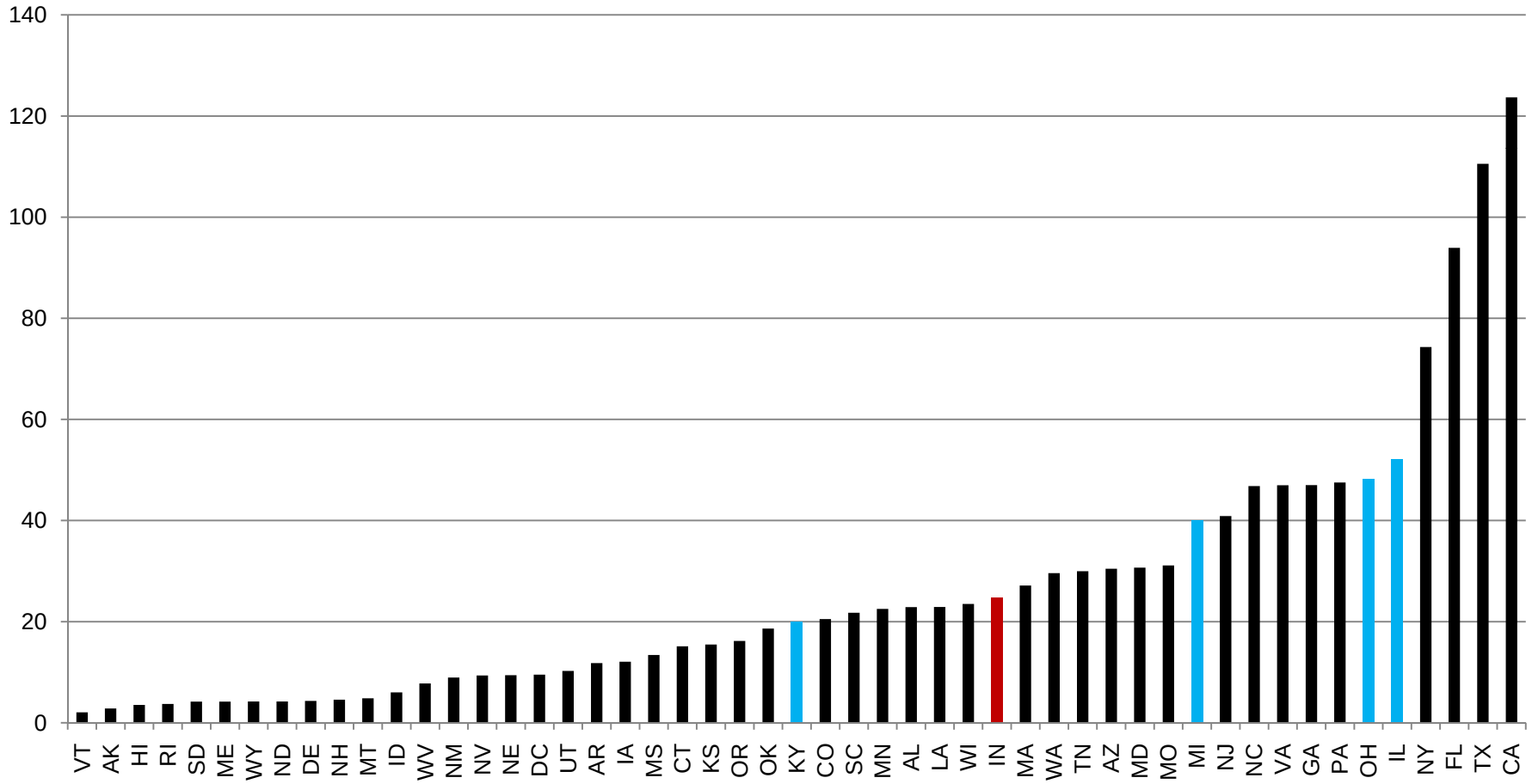
# Indiana - an Industrial State

- In 2007, Indiana accounted for 2.9% of the nation's retail electricity sales
  - 11th most in the U.S.
- But Indiana accounted for 4.9% of the nation's industrial sector retail electricity sales
  - 4th most in the U.S.

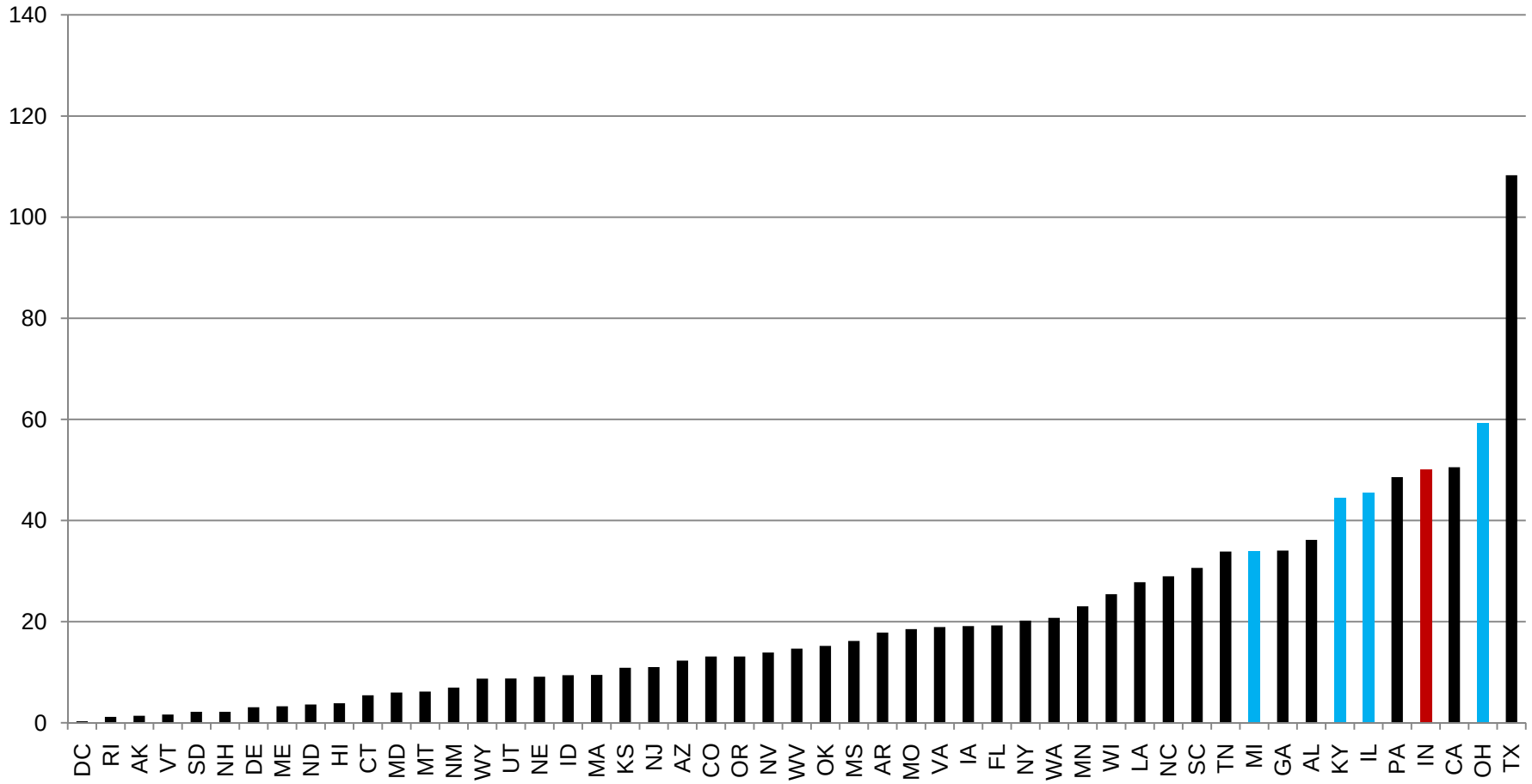
# 2007 Residential Electricity Sales (million MWh)



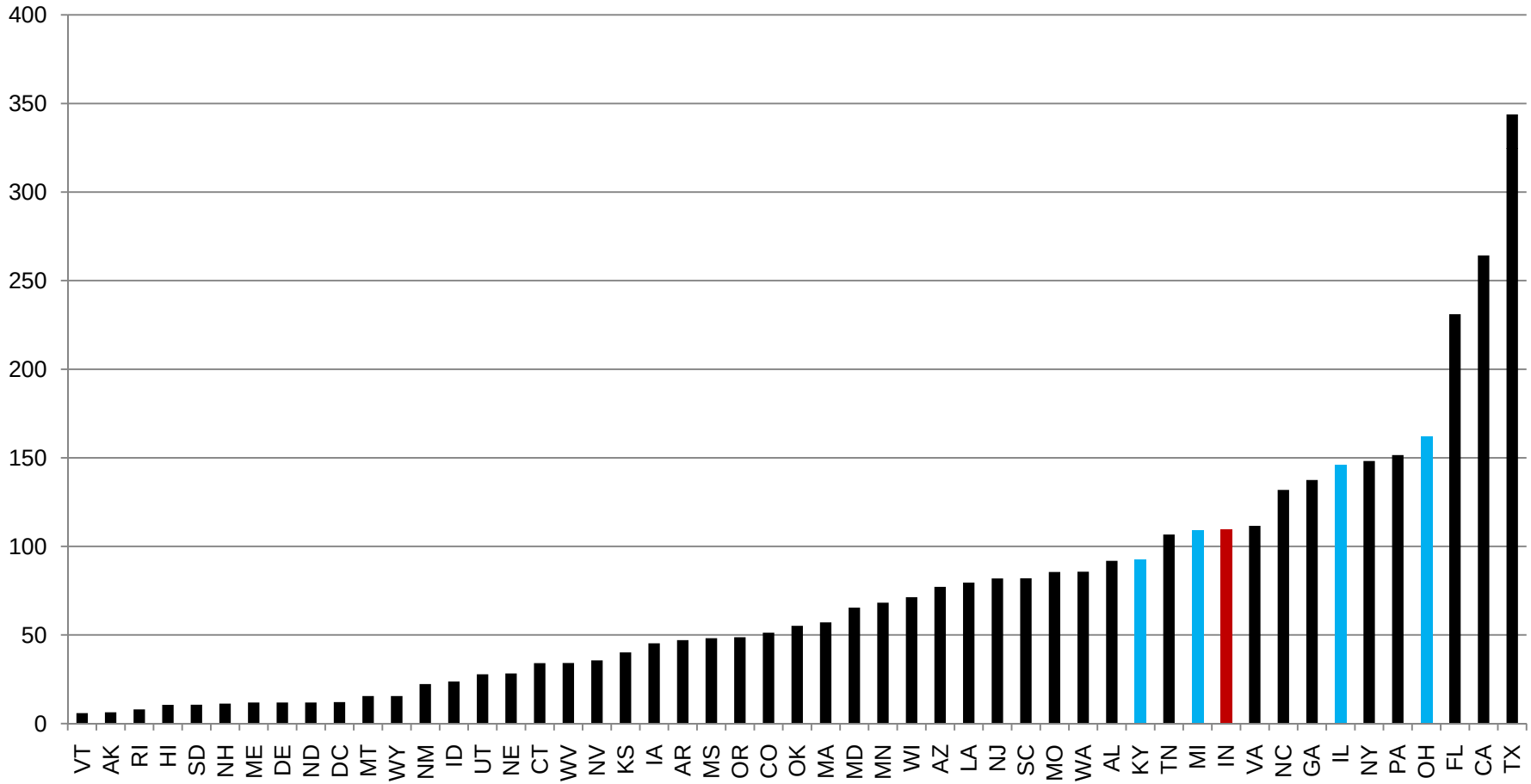
# 2007 Commercial Electricity Sales (million MWh)



# 2007 Industrial Electricity Sales (million MWh)



# 2007 Total Electricity Sales (million MWh)



# Changes in Electricity Sales from 2007 to 2008

- Investor-owned utilities -3.0%
- Not-for-profit utilities +1.8%
- All utilities -2.0%

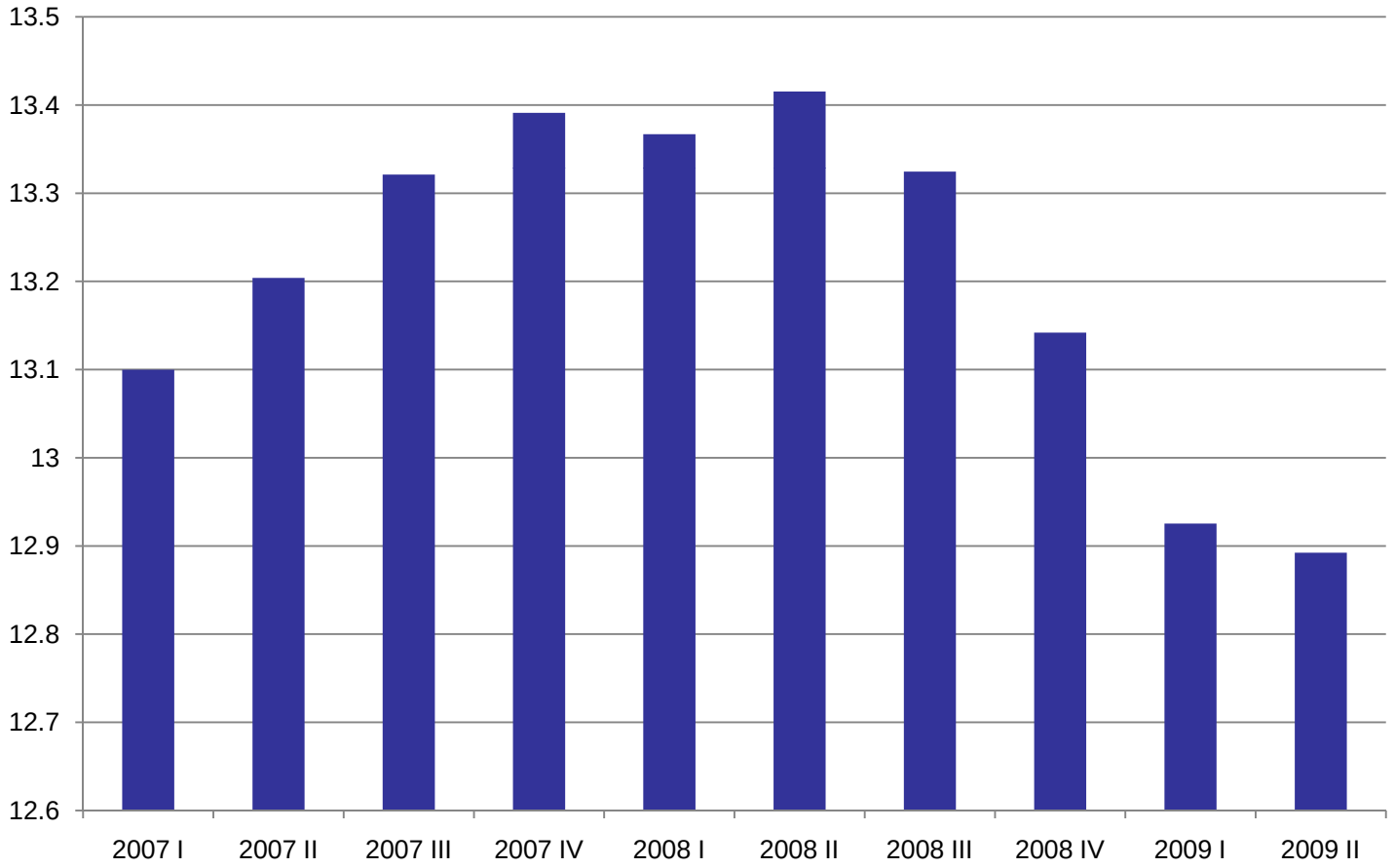
# Was it the Economy?

- Indiana Gross Domestic Product dropped by 0.6% from 2007 to 2008
- But 2008 was an exceptionally cool summer, which reduces electricity demand
  - Cooling degree days in Indianapolis dropped by 30% from 2007

# For the Investor-Owned Utilities:

- Residential electricity sales dropped by 2.4% from 2007 to 2008
  - More sensitive to weather than other sectors
- Commercial and industrial sales dropped by 3.3% from 2007 to 2008
  - More sensitive to economic factors than the residential sector

# U.S. Gross Domestic Product (trillions of 2005 dollars)



# This Year – Effects are More Pronounced

- Economic impact largely confined to last quarter of 2008
- Economic impact will be felt across all 4 quarters of 2009
- The mild summer of 2008 has been repeated

# Impact on 2009 Forecast

- Price trajectory should have similar shape (increase in early years, relatively constant in later years)
- Electricity sales and peak demand projections relatively stagnant in early years, then growing
- Resource requirements lower than previous projections (combination of new resources and delayed growth in demand)

# Potential Future Resources

- Energy efficiency/demand-side management/price responsive demand
  - recent renewed interest in efficiency
  - smart grid may enhance opportunities (but at some cost)
- Purchases from non-jurisdictional generators (either in or out of Indiana)
  - opportunities becoming more limited

# Fuel Sources for New Resources

- Coal
  - permitting, construction time, $CO_2$ uncertainty
- Natural gas
  - fuel cost variability
- Nuclear
  - permitting, public opposition, construction time
- Wind
  - limited resource, intermittent supply
- Solar
  - limited resource, cost, intermittent supply
- Biogas
  - limited resource

# Wind Developments

| Project Name | Counties | Developer | Rated Capacity (MW) | Construction Schedule | Status |
|---|---|---|---|---|---|
| Benton County Wind Farm | Benton | Orion Energy | 130 | Completed May 2008 | Completed |
| Fowler Ridge Wind Farm I | Benton | BP Alternative Energy & Dominion | 400 | Completed March 2009 | Completed |
| Fowler Ridge Wind Farm II | Benton | BP Alternative Energy & Dominion | 350 | Under Construction | Under Construction |
| Fowler Ridge Wind Farm III | Benton | BP Alternative Energy & Dominion | 350 | | Pending |
| Hoosier Wind Project | Benton | enXco | 106 | Under Construction | Under Construction |
| Tri-County Wind Energy Center | Tippecanoe, Montgomery, Fountain | Invenergy | 300-500 | Begin 2010 | Proposed |
| Meadow Lake Wind Farm I | Benton, White | Horizon Energy | 200 | Under Construction | Under Construction |
| Meadow Lake Wind Farm II | Benton, White | Horizon Energy | 800 | | Proposed |
| | Randolph | Horizon Energy | 100-200 | | Proposed |
| | Howard | Horizon Energy | 200 | | Proposed |
| | Boone | enXco | 200-400 | | Proposed |

# Indiana Utility Wind PPAs

| Utility | Project | State | MW | Status |
|---|---|---|---|---|
| Duke Energy | Benton County Wind Farm | Indiana | 100 | Operational |
| Vectren | Benton County Wind Farm | Indiana | 30 | Operational |
| WVPA | AgriWind | Illinois | 8 | Operational |
| Indiana Michigan | Fowler Ridge I | Indiana | 100 | Operational |
| Hoosier Energy | Story County Wind Energy Center | Iowa | 25 | Operational |
| NIPSCO | Buffalo Ridge | South Dakota | 50 | Approved |
| NIPSCO | Barton Windpower | Iowa | 50 | Approved |
| IPALCO | Hoosier Wind | Indiana | 106 | Approved |
| IPALCO | Lakefield Wind | Minnesota | 201 | Pending |
| Indiana Michigan | Fowler Ridge II | Indiana | 50 | Pending |
| Vectren | Fowler Ridge II | Indiana | 50 | Pending |

# Further Information

State Utility Forecasting Group

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