

What's Affecting and How High Will Electricity Rates GO?

KSPMA-TSPMA

Workshop

February 5, 2016

Pigeon Forge Tennessee

Ron Willhite

Kentucky School Boards Association

John Myers

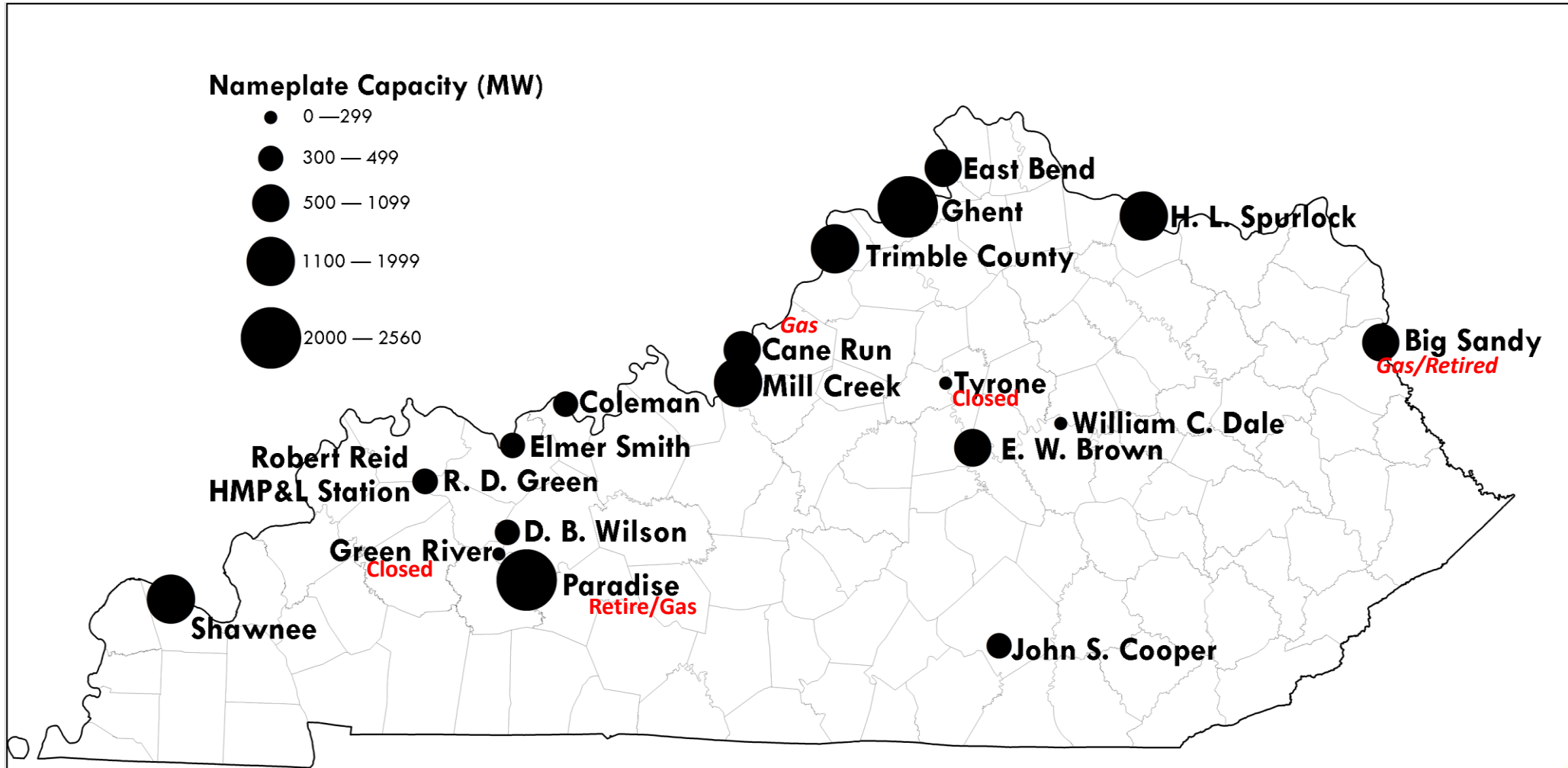
Tennessee Valley Authority



Kentucky's Changing Electricity Profile

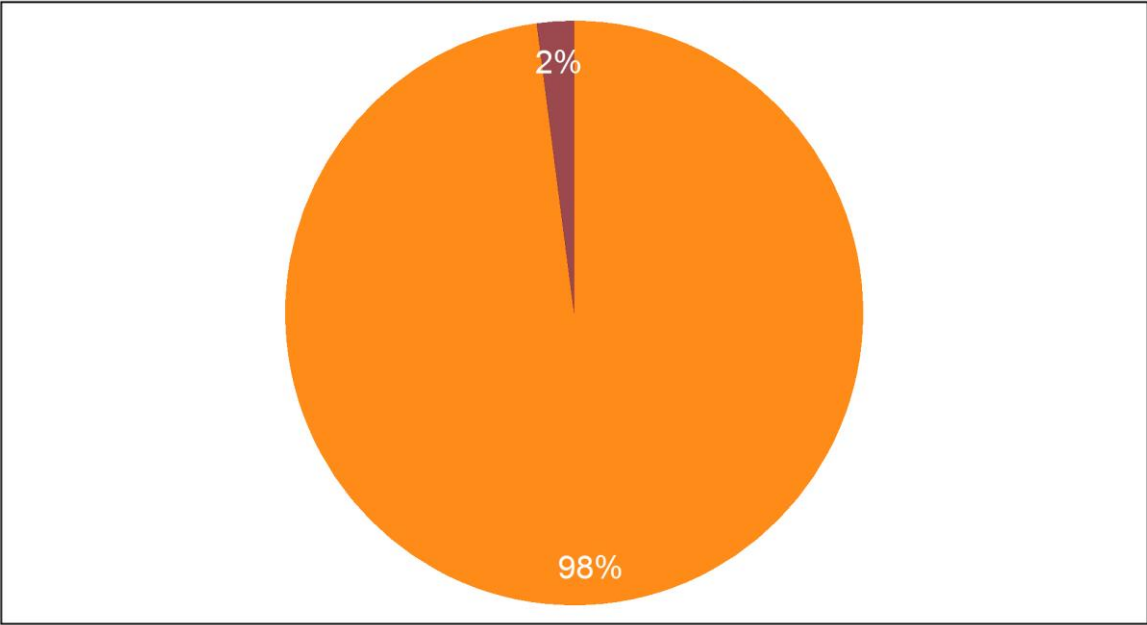
- Competitive advantage of low prices declining
- Forty percent of coal-fired generation units retired by 2016
- Greenhouse Gas regulations limiting replacement options
- Low gas prices driving switch to natural gas without Greenhouse Gas regulations

Electric Generating Plants



Coal Consumption by End-User

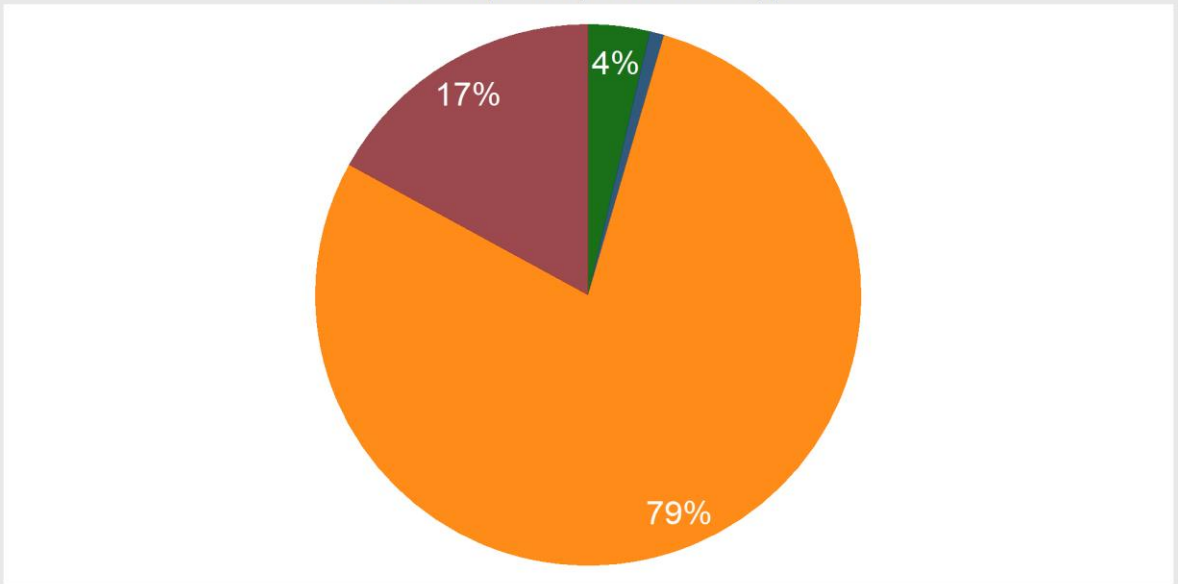
Western Kentucky Coal Consumers, 2013
Consumption by End-User Type



Electric Power Sector Industrial Plants Excluding Coke

Kentucky Energy Database, EEC-DEDI, 2015
Data Source: EIA Annual Coal Distribution Report

Eastern Kentucky Coal Consumers, 2013
Consumption by End-User Type



Coke Plant Commercial/Institutional
Electric Power Sector Industrial Plants Excluding Coke

Kentucky Energy Database, EEC-DEDI, 2015
Data Source: EIA Annual Coal Distribution Report

Kentucky Coal Deliveries

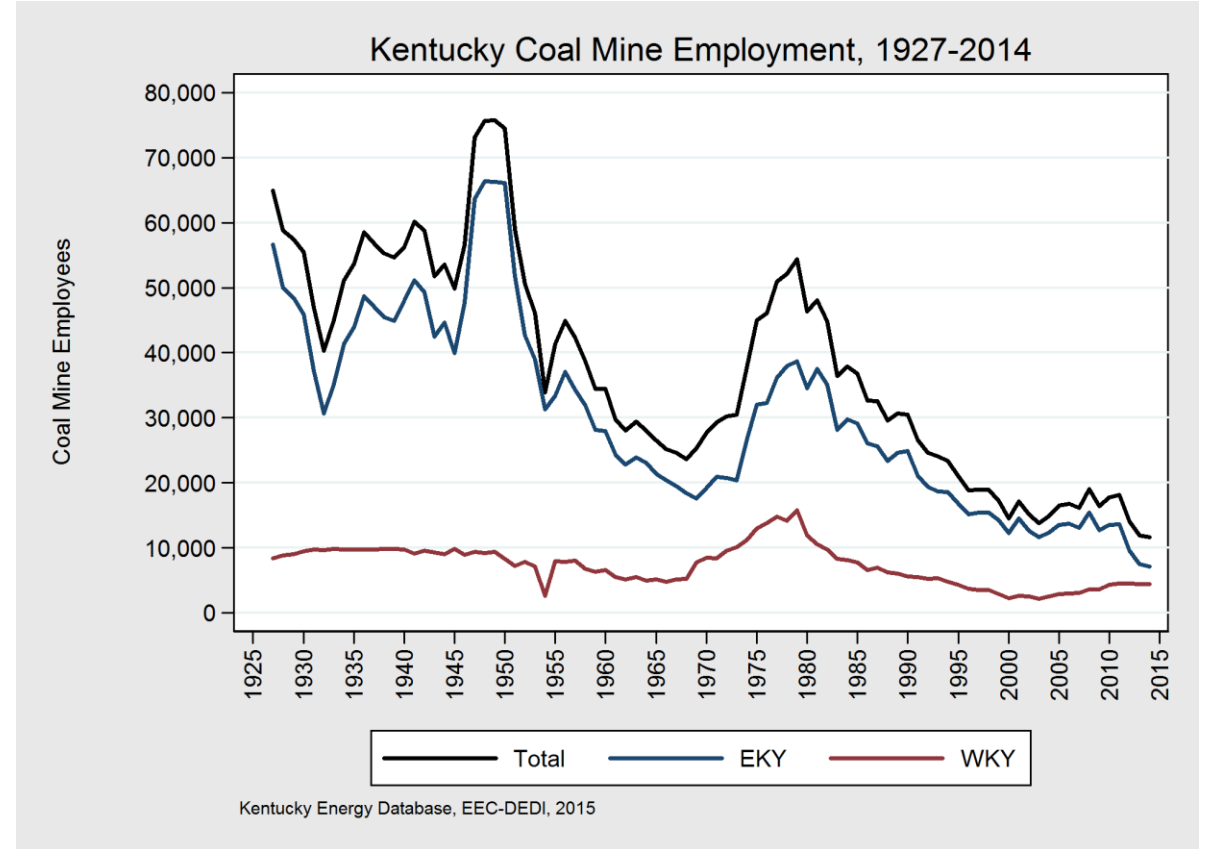
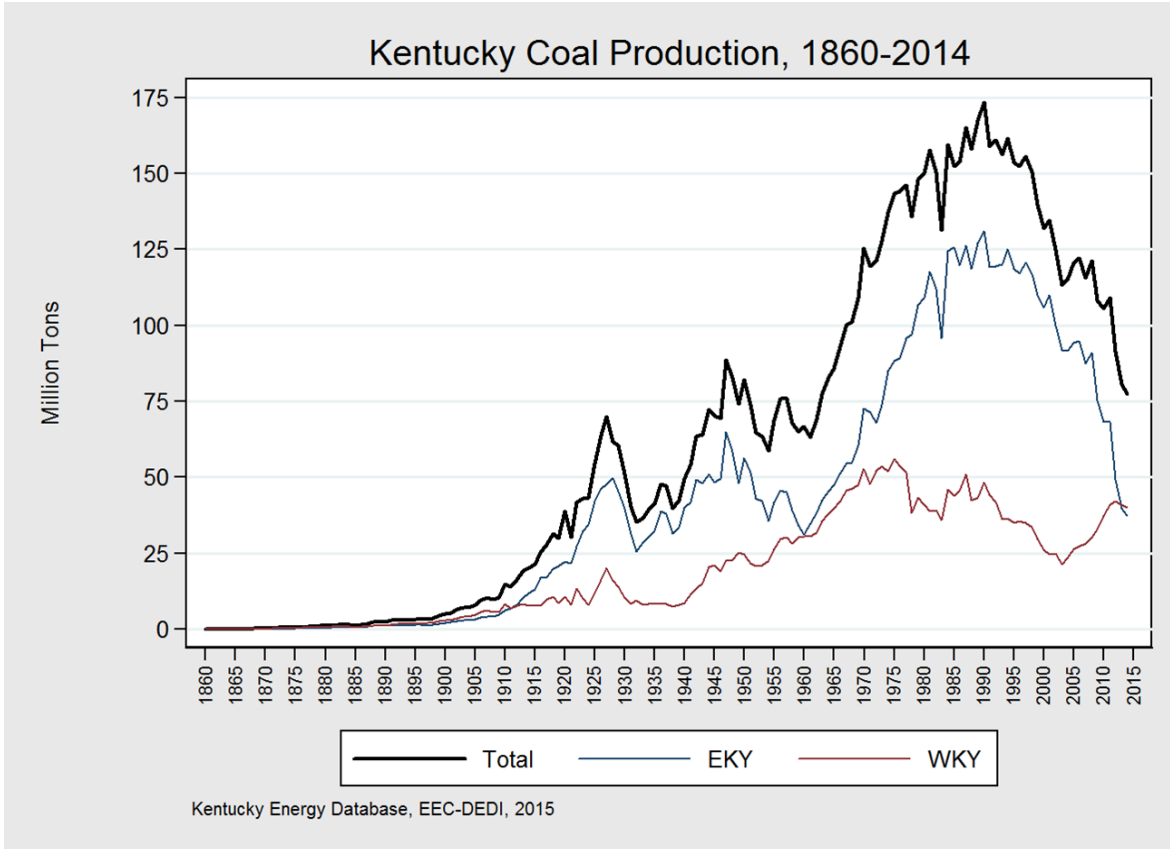
West Kentucky

East Kentucky

| Western Kentucky Coal Deliveries to Electric Power Plants, 2014 | | | | |
|---|----------|--|-------|--------------------------|
| Rank | Plant ID | Power Plant Name | State | Annual Deliveries (Tons) |
| 1 | 1378 | Paradise | KY | 5,414,270 |
| 2 | 1356 | Ghent | KY | 3,757,227 |
| 3 | 1364 | Mill Creek | KY | 3,095,324 |
| 4 | 136 | Seminole | FL | 2,439,477 |
| 5 | 6071 | Trimble County | KY | 1,699,398 |
| 6 | 983 | Clifty Creek | IN | 1,677,037 |
| 7 | 2850 | J M Stuart | OH | 1,350,214 |
| 8 | 6823 | B B Wilson | KY | 1,307,770 |
| 9 | 645 | Big Bend | FL | 1,247,360 |
| 10 | 8827 | IMT Transfer | FL | 1,162,579 |
| 11 | 6639 | R D Green | KY | 1,161,670 |
| 12 | 1363 | Cane Run | KY | 1,147,537 |
| 13 | 6018 | East Bend | KY | 1,110,137 |
| 14 | 8816 | Davant Transfer | FL | 1,090,579 |
| 15 | 1382 | HMP&L Station Two Henderson | KY | 1,070,604 |
| 16 | 3407 | Kingston | TN | 1,000,377 |
| 17 | 3399 | Cumberland | TN | 995,215 |
| 18 | 6041 | H L Spurlock | KY | 985,592 |
| 19 | 1374 | Ermer Smith | KY | 953,943 |
| 20 | 50 | Widows Creek | AL | 833,973 |
| 21 | 2721 | James E. Rogers Energy Complex | NC | 718,714 |
| 22 | 8102 | General James M Gavin | OH | 645,139 |
| 23 | 703 | Bowen | GA | 536,372 |
| 24 | 8848 | Ceredo | WV | 488,765 |
| 25 | 6019 | W H Zimmer | OH | 434,382 |
| 26 | 1381 | Kenneth C Coleman | KY | 369,730 |
| 27 | 2832 | Miami Fort | OH | 366,556 |
| 28 | 6031 | Killen Station | OH | 359,184 |
| 29 | 1355 | E W Brown | KY | 201,411 |
| 30 | 26 | E C Gaston | AL | 167,249 |
| 31 | 8 | Gorgas | AL | 144,464 |
| 32 | 2830 | Walter C Beckjord | OH | 129,598 |
| 33 | 8851 | Associated Terminals | MS | 127,750 |
| 34 | 47 | Colbert | AL | 127,370 |
| 35 | 3406 | Johnsonville | TN | 113,732 |
| 36 | 3943 | First Energy Fort Martin Power Station | WV | 100,332 |
| 37 | 6705 | Warrick | IN | 54,019 |
| 38 | 6004 | FirstEnergy Pleasants Power Station | WV | 53,601 |
| 39 | 564 | Stanton Energy Center | FL | 25,498 |
| 40 | 628 | Crystal River | FL | 19,074 |
| 41 | 2727 | Marshall | NC | 13,001 |
| 42 | 6264 | Mountaineer | WV | 8,674 |
| 43 | 3396 | Bull Run | TN | 5,502 |
| 44 | 3947 | Kammer | WV | 5,305 |
| 45 | 3935 | John E Amos | WV | 4,700 |
| 46 | 976 | Marion | IL | 2,753 |

| Rank | Plant ID | Power Plant Name | State | Annual Deliveries (Tons) |
|------|----------|----------------------------------|-------|--------------------------|
| 1 | 703 | Bowen | GA | 2,557,543 |
| 2 | 1353 | Big Sandy | KY | 1,387,116 |
| 3 | 1733 | Monroe | MI | 1,292,221 |
| 4 | 6249 | Winyah | SC | 1,272,047 |
| 5 | 7213 | Clover | VA | 1,161,454 |
| 6 | 628 | Crystal River | FL | 1,131,445 |
| 7 | 3298 | Williams | SC | 998,071 |
| 8 | 2712 | Roxboro | NC | 935,177 |
| 9 | 50481 | Tennessee Eastman Operations | TN | 855,731 |
| 10 | 3297 | Wateree | SC | 839,865 |
| 11 | 7210 | Cope | SC | 818,491 |
| 12 | 2721 | James E. Rogers Energy Complex | NC | 765,404 |
| 13 | 3797 | Chesterfield | VA | 738,767 |
| 14 | 564 | Stanton Energy Center | FL | 679,592 |
| 15 | 3948 | Mitchell | WV | 675,818 |
| 16 | 3396 | Bull Run | TN | 651,529 |
| 17 | 2727 | Marshall | NC | 586,041 |
| 18 | 2872 | Muskingum River | OH | 540,293 |
| 19 | 10672 | Cedar Bay Generating Company LP | FL | 483,433 |
| 20 | 1384 | Cooper | KY | 477,513 |
| 21 | 3935 | John E Amos | WV | 446,297 |
| 22 | 709 | Harlee Branch | GA | 358,948 |
| 23 | 50900 | Covington Facility | VA | 332,141 |
| 24 | 130 | Cross | SC | 308,695 |
| 25 | 3809 | Yorktown | VA | 307,279 |
| 26 | 1008 | R Gallagher | IN | 267,984 |
| 27 | 6166 | Rockport | IN | 265,864 |
| 28 | 54081 | Spruance Genco LLC | VA | 220,781 |
| 29 | 1355 | E W Brown | KY | 215,969 |
| 30 | 50398 | International Paper Savanna Mill | GA | 199,142 |
| 31 | 1743 | St Clair | MI | 194,192 |
| 32 | 3287 | McMeekin | SC | 187,852 |
| 33 | 6250 | Mayo | NC | 177,635 |
| 34 | 47 | Colbert | AL | 146,531 |
| 35 | 26 | E C Gaston | AL | 135,099 |
| 36 | 7737 | Kapstone | SC | 122,423 |
| 37 | 8042 | Belews Creek | NC | 114,247 |
| 38 | 54101 | Georgia-Pacific Cedar Springs | GA | 105,954 |
| 39 | 2718 | G G Allen | NC | 97,438 |
| 40 | 3938 | Philip Sporn | WV | 93,779 |
| 41 | 2706 | Asheville | NC | 90,770 |
| 42 | 733 | Kraft | GA | 85,516 |
| 43 | 663 | Deerhaven Generating Station | FL | 84,702 |
| 44 | 988 | Tanners Creek | IN | 83,546 |

Coal Production and Employment Impact



Levelized **Production** Cost of Energy

| 2020 Projections: US DOE and National Renewable Energy Laboratory | | | |
|---|-----------------|--------------------|-------------------------|
| Source | Capacity Factor | Levelized Cost/KWh | Comments |
| Dispatchable | | | |
| Conventional Coal | 85 | \$0.092 | |
| Advanced Coal w/ CCS | 85 | \$0.128 | Technology not scaled |
| Conventional NG Combined Cycle | 87 | \$0.083 | |
| Advanced CC w/ CCS | 87 | \$0.106 | Technology not scaled |
| Advanced Nuclear | 90 | \$0.089 | Safety Concerns |
| Geothermal | 94 | \$0.061 | |
| Biomass | 83 | \$0.094 | |
| NonDispatchable | | | |
| Wind | 35 | \$ 0.075 | Transmission Investment |
| Wind Offshore | 38 | \$ 0.176 | Transmission Investment |
| Solar PV | 25 | \$ 0.117 | Transmission Investment |
| Solar Thermal | 20 | \$ 0.214 | Transmission Investment |
| Hydroelectric | 52 | \$ 0.090 | |

Best Fuel Source – Energy Efficiency

- Doesn't require new technology
 - Can do it today
- Reduces Greenhouse Gas
 - Lowers Cost

Savings Potential

| | Energy per tile, kBtu/sf/yr | Dollars per tile, \$/sf | Annual Operating Costs, \$ | Annual Savings, \$ |
|-------------------------|-----------------------------|-------------------------|----------------------------|--------------------|
| National Average School | 73 | \$ 1.83 | \$ 182,500 | |
| Average Kentucky School | 58 | \$ 1.45 | \$ 145,000 | \$ 37,500 |
| ENERGY STAR School | 50 | \$ 1.25 | \$ 125,000 | \$ 57,500 |
| Net Zero Ready School | 20 | \$ 0.50 | \$ 50,000 | \$ 132,500 |

For a 100,000 Square Foot Middle School

Key Factors for Successful Energy Management Program

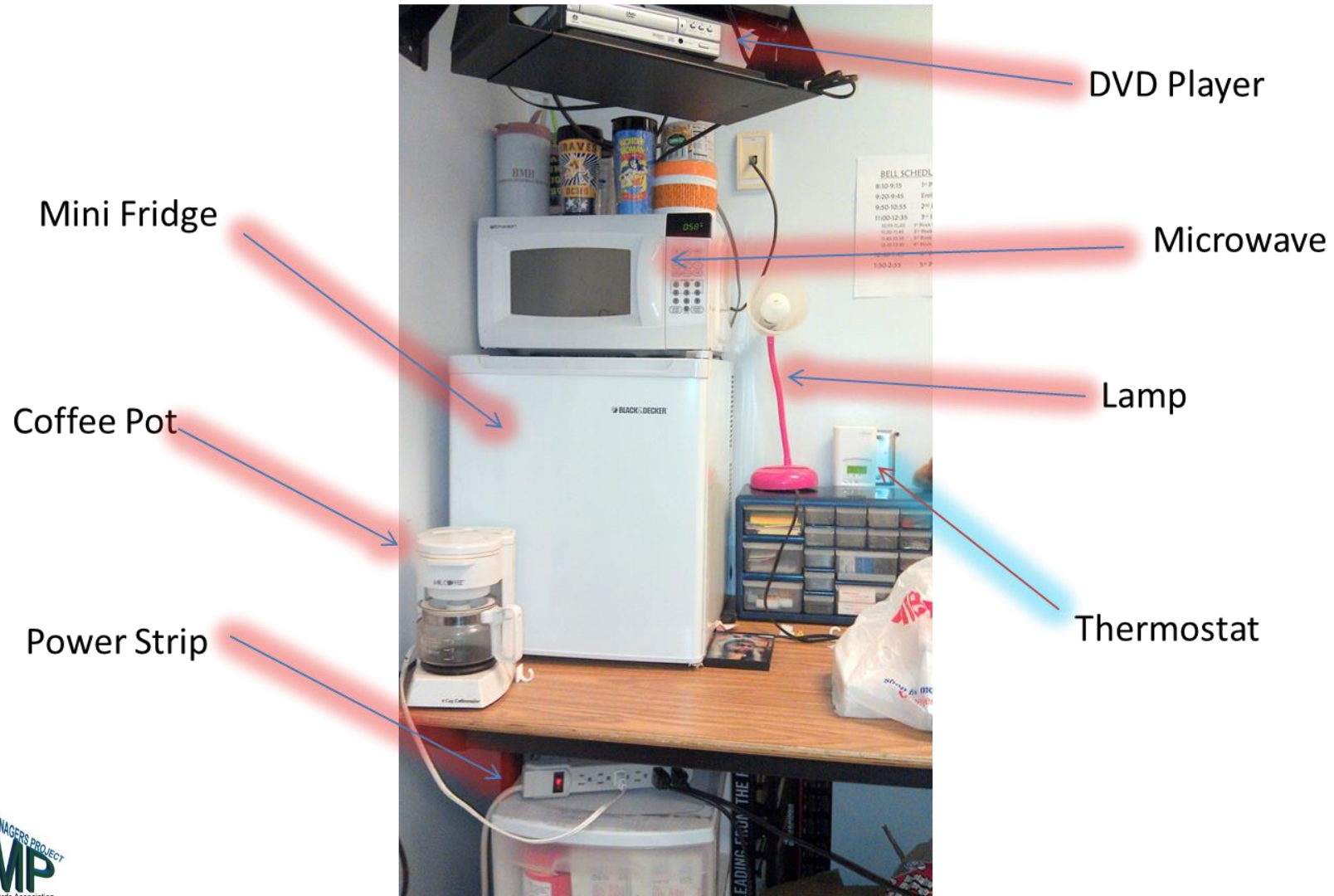
- Support from School Board & Superintendent
- Buy in by all Principals - the building leaders
- Buy in from all faculty and staff
- Educate students on saving energy
- Provide weekly and monthly report for competition
- Identify Energy Conservation Measures (ECM's)
- Implement ECM's
- Recognize achievements

Education and Accountability

- Cultural/Behavior Changes
- Using Audits to Drive Energy Conservation Measures -- Performance Upgrades
- Involve Students



Behavior Opportunities



LED Outdoor Lighting



Student Energy Teams



Owen Primary School

Construction and Renovation

Net Zero Buildings

- New Construction “Ready”
 - Building EUI below 20KBtu/sf
 - Affordable w/o Solar Panels
- Major Renovations
 - Building EUI below 30KBtu/sf
- Energy Standards or Goals as Part of the Building Contract

Demand Response

- Demand Response (ENERNOC Program)
- Smart Meters for Demand Response

Operational Savings for Equipment Retrofits

- KRS157.455
 - Life-Cycle Costing
- Financing of Capital Improvements using Energy Savings
 - Example

Real Question is Not “What does it Cost?” but “What does it save and how soon?”

Operational Savings for Equipment Retrofits

Example:

- Your energy manager has identified an air infiltration problem in one of your buildings and estimates the savings will be \$15,000 per year but will cost \$45,000 to repair.
- You say, “No way, I’ve got to find \$130,000 to repair a roof in another building.”
- ??????

Envelope Improvement



Operational Savings for Equipment Retrofits

Example:

- Assume the repaired building will last 20 years
- Assume 5% discount rate
- By understanding the Life Cycle Cost and the Time Value of Money, you can determine the Present Value of the \$15,000 per year annuity over the next 20 years

Operational Savings for Equipment Retrofits

Example:

- $\$15,000 \times 12.4622^* = \$186,933$ (Present Value)
- $\$186,933 - \$45,000 = \$141,933$ (Net Present Value)



❖ The Net Present Value of the Energy Savings will fund the Roof Repair!!

Impact of Clean Power Plan

KU - LGE Newsletter

FIRST LOOK AT THE **CLEAN POWER PLAN**

The U.S. Environmental Protection Agency recently released the Clean Power Plan, establishing ambitious targets to cut nationwide carbon emissions by 32 percent from 2005 levels by 2030. We are analyzing the rule carefully to clearly understand its requirements for meeting compliance timelines and carbon emission reduction targets.

States have one year to submit an initial plan to meet the new requirements and have until 2018 to submit final implementation plans for meeting the reduction targets. Kentucky's final plan will guide our decisions on how to achieve the new reductions.

We are very concerned that carbon emission reduction targets for Kentucky have been tightened

even further, meaning the challenges to meet the revised goals will be significant. We urged the EPA to take into consideration how any necessary changes to meet these reductions could ultimately impact the state's economy and our customers.

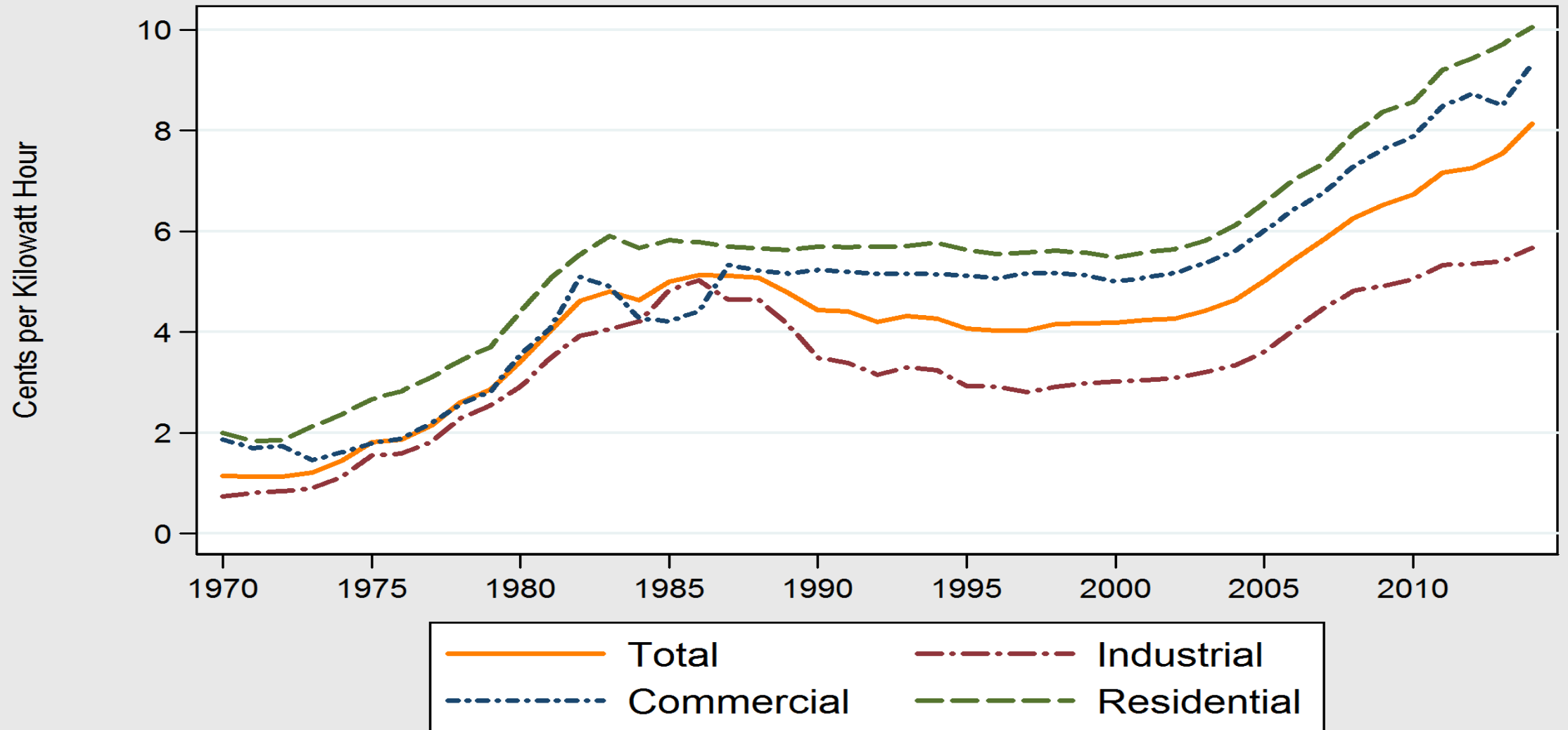
We are disappointed in the agency's final decision.

While the full impact of the EPA's action is not yet known, it is likely the final rule will further impact coal use and result in an increase in the cost of electricity for customers.

Going forward we will continue to evaluate the lowest reasonable-cost methods to both meet customer energy needs and environmental requirements.

Kentucky Average Electricity Price, 1970-2014

Nominal Prices by Sector

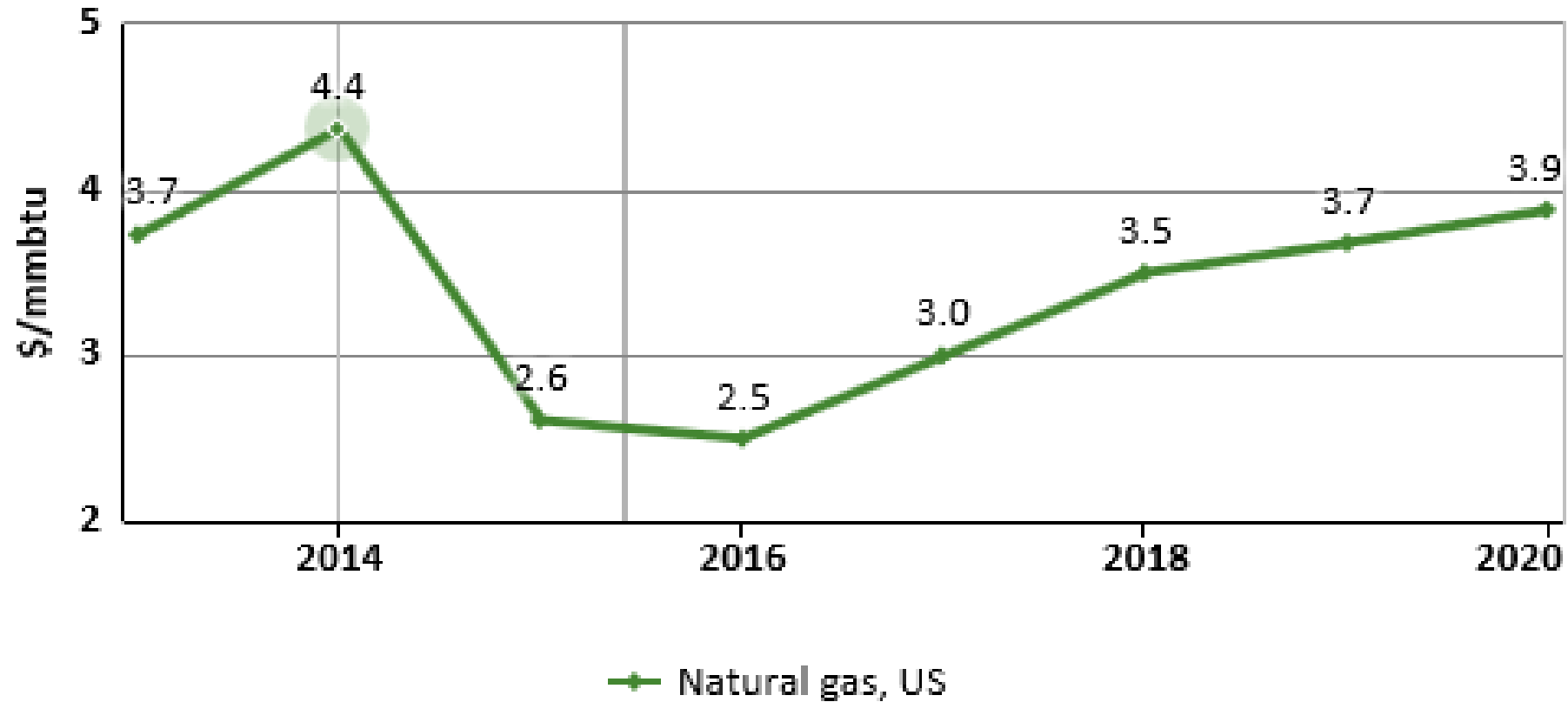


Kentucky Energy Database, EEC-DEDI, 2015
Data Source: EIA Form 861 & 826

Average K-12 Price by Supplier

| | |
|---------------------|----------------|
| OMU | \$0.032 |
| KU | \$0.093 |
| DUKE | \$0.095 |
| SKRECC | \$0.099 |
| Tri-County | \$0.105 |
| Clark Energy | \$0.108 |
| LGE | \$0.108 |
| Meade | \$0.112 |
| Murray | \$0.112 |
| KP | \$0.112 |
| Pennnyrile | \$0.114 |
| Warren | \$0.117 |

Natural Gas Price Outlook



Source: [World Bank Commodity Forecast Price Data, January 2016](#)

Your Future is Now...

**Figure 8. MUNIS K-12 Facility Energy Expenditures
FY2000 - FY2015**

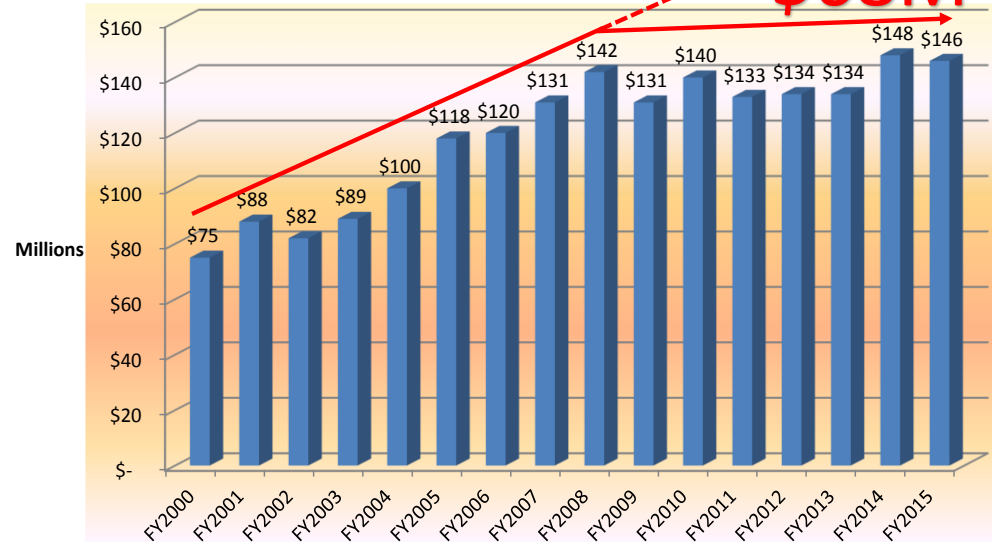
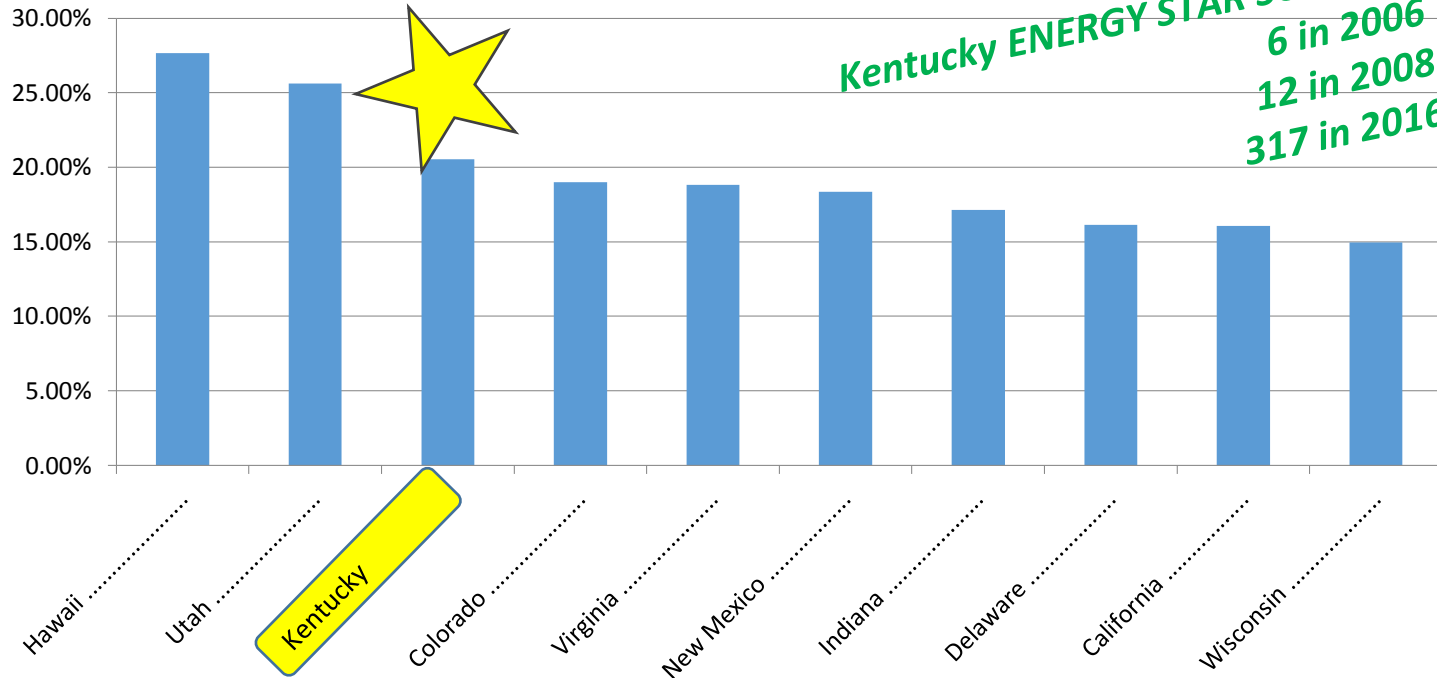


Table 3. Annual Energy Savings Potential

| Level | EUI | Incremental Savings | Annual Savings |
|----------------|------|---------------------|----------------|
| Current | 57.5 | | \$16.4M |
| ENERGY STAR | 50 | \$21.1M | \$37.5M |
| Best Performer | 40 | \$21.5M | \$59.0M |

Top Ten States: Kentucky Ranks Third for Percentage ENERGY STAR Schools of Total Schools

February 2, 2016



Final Message: Get an Energy Manager

- Dedicated Resource
 - No priority shuffling
 - Significant ROI (This NON classroom position saves multiple classroom positions)
 - Knowledgeable connection to utility companies
- Skilled Resource
 - Evaluates and presents energy saving options
 - Facilitates policy compliance
 - Translates technical information

Final Message: Work With Your Utility

- **PROGRAMS !!!!**

- **REBATES!!!!**

- **PROGRAMS !!!!!**

- **REBATES !!!!!**

