The background of the slide features a large, faint, light-colored version of the Indiana State Seal. The seal is circular and contains a central figure of a Native American holding a bow and arrow, with a star above his head. The word "INDIANA" is written in an arc above the figure. The seal is surrounded by a ring of stars.

Aspects and Qualities Needed for a Secure Energy Future in Indiana: Residential, Commercial, Industrial, and Environmental

**Richard G. Lugar Center for Renewable Energy
May 10, 2016**

Sen. Jim Merritt, Chairman, Senate Utilities Committee

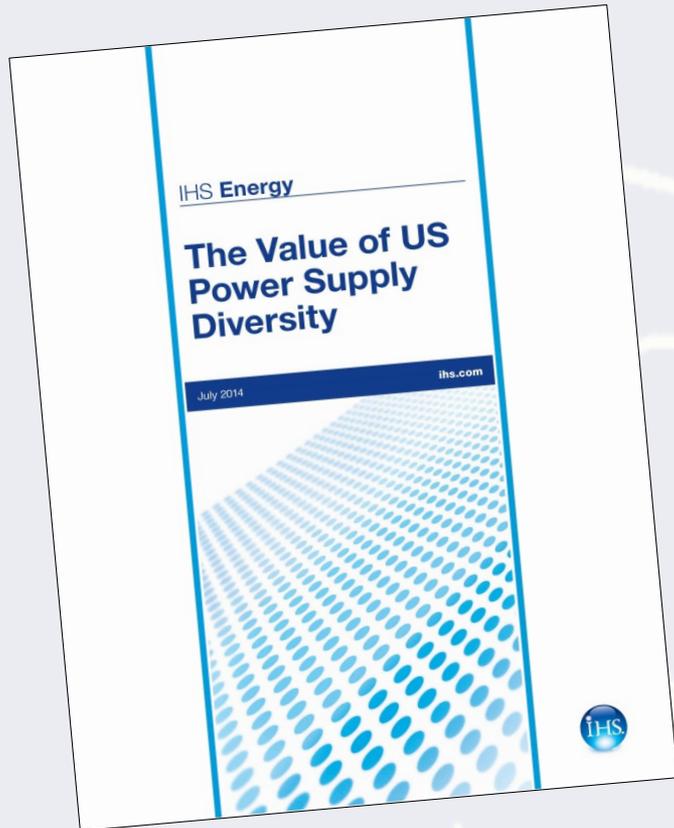
Outline

- **Value of fuel diversity – “All of the Above”**
- **Changes and trends to national and Indiana fuel mix in generating electricity**
- **Renewables, Energy Storage, Energy Efficiency, and Nuclear**

The background features a large, faint watermark of the Indiana State Seal. The seal consists of a central torch with a flame, surrounded by a circular arrangement of stars. The word "INDIANA" is arched above the torch. The entire seal is rendered in a light, semi-transparent yellow color.

**Value of Fuel Diversity /
“All of the Above”**

The benefits of a diversified portfolio:



- Lowers cost of generating electricity by more than \$93 billion per year
- 25% decrease in retail power prices, along with decreased price volatility
- \$200 billion increase in GDP each year due to lower electricity prices
- 1 million more jobs resulting from higher GDP
- \$2,100 decrease in electricity costs per year for the typical household

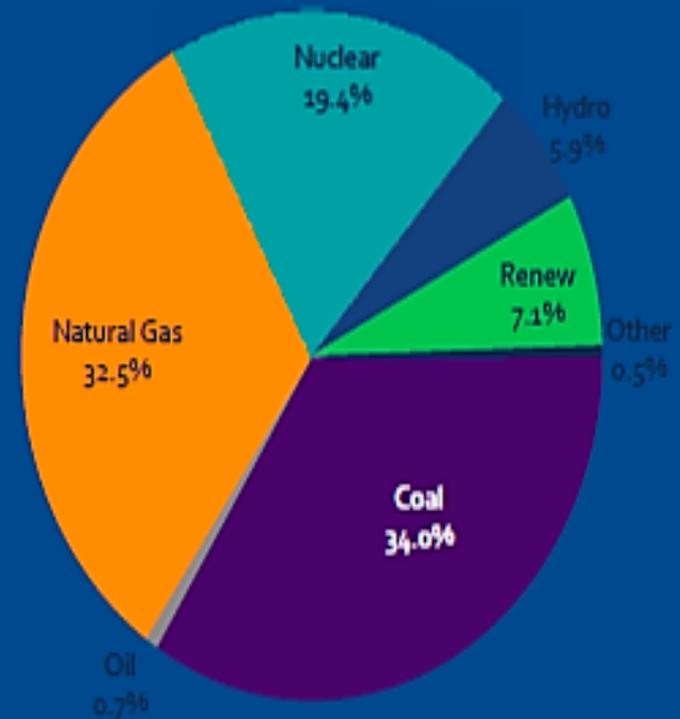
Fuel Diversity is Key!

Fuel diversity and flexibility are critical

Electric companies rely on many fuels to generate electricity – coal, natural gas, nuclear energy, hydropower and other renewables, and other fuel sources.

Fuel diversity is key to:

- ❑ Provide affordable electricity: Respond to fuel price fluctuations
- ❑ Maintain reliability and energy security: Respond to extreme events and/or supply constraints
- ❑ Improve resiliency: Respond to outages and security threats
- ❑ Integrate renewables: Respond to weather and resources variability
- ❑ Meet electricity demand: Respond to changing consumption level and patterns



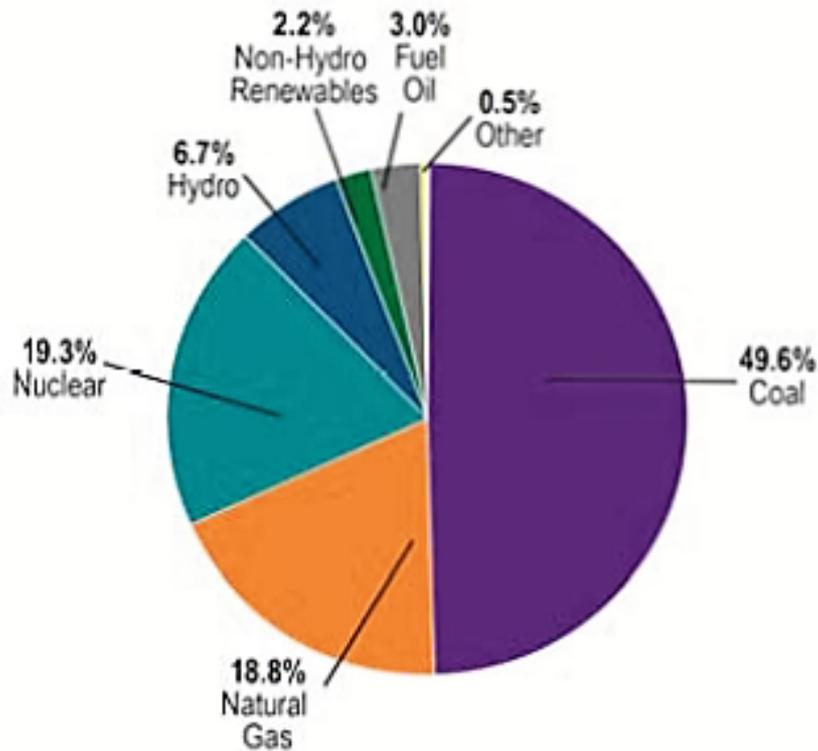
2015 National Fuel Mix

The background of the slide features a large, light-colored watermark of the Indiana state seal. The seal consists of a central torch with a flame, surrounded by a circular arrangement of stars. The word "INDIANA" is arched above the torch. The watermark is centered and serves as a decorative backdrop for the text.

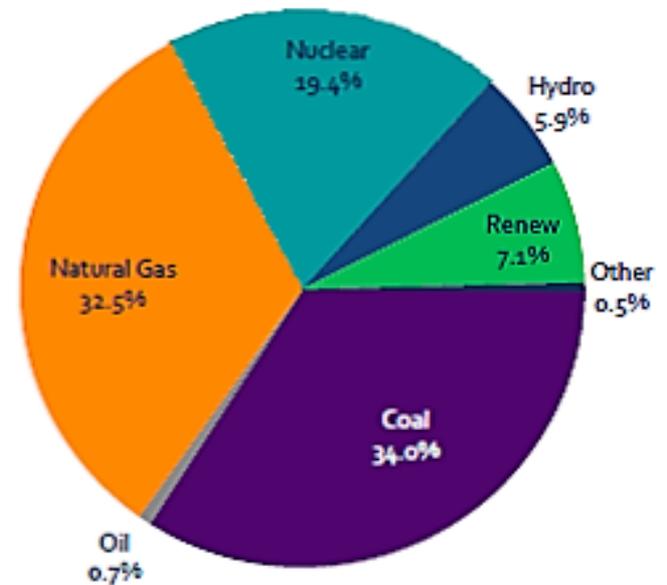
Changes and trends to fuel mix

Our National Fuel Mix is Changing

2005 National Fuel Mix



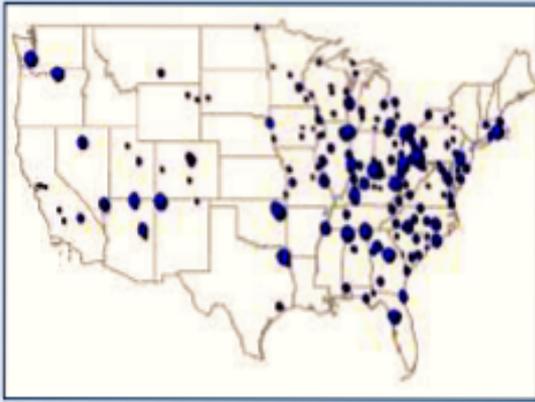
2015 National Fuel Mix (estimate)



Trends in Sources of Electricity

Coal's share is declining

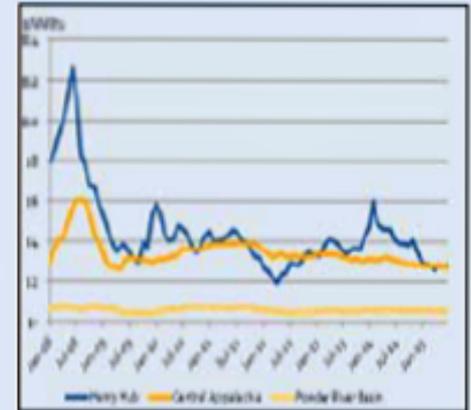
Coal retirements 2010-2025



A third of the coal fleet could retire between 2010-2030

Natural Gas is increasing

Natural gas and coal prices



Low natural gas prices are reducing coal plant utilization

Renewables are increasing



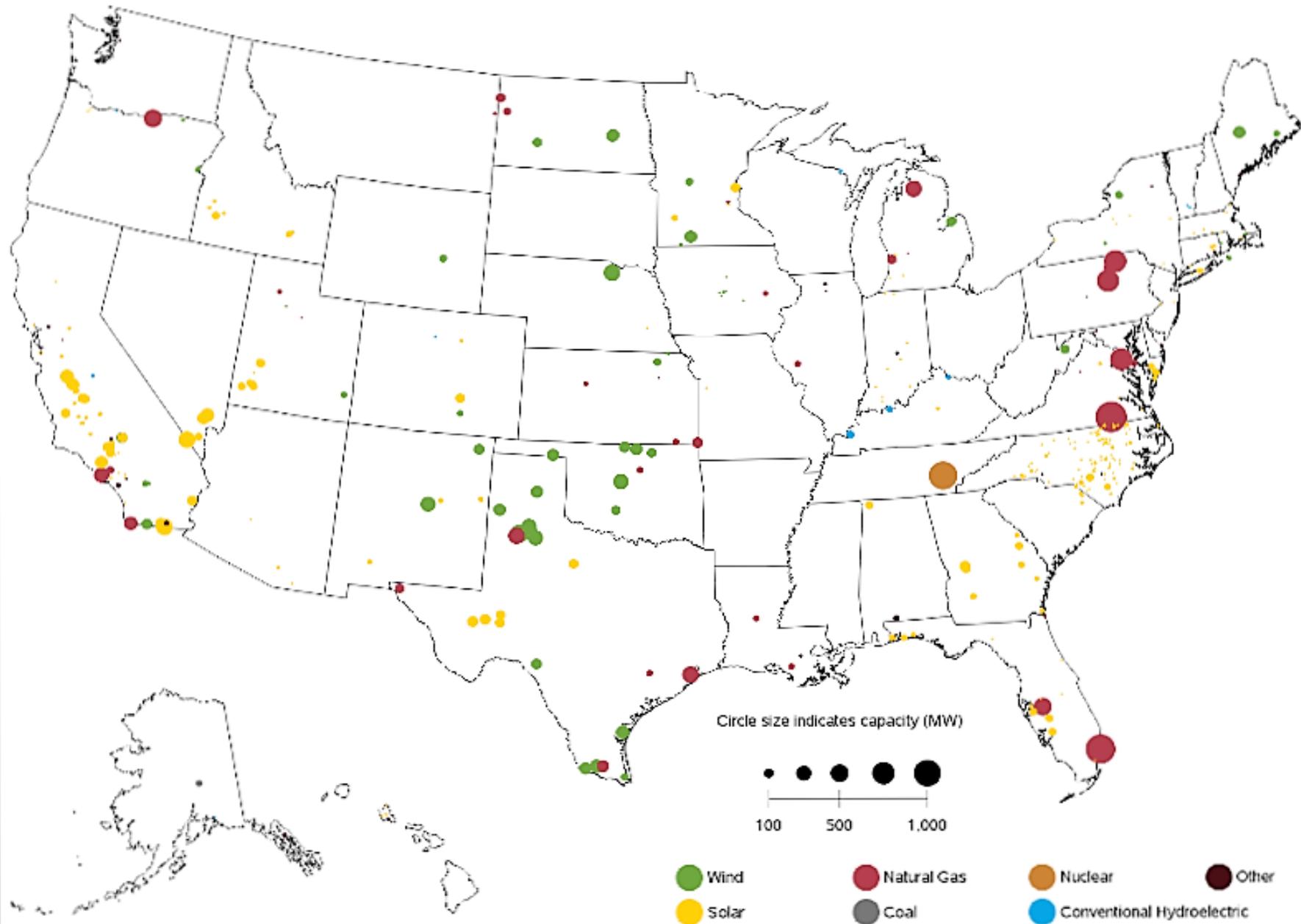
The share of renewable energy is growing rapidly and new markets are emerging

Nuclear is struggling

11% of nuclear generation is at risk of early closure. 4 units have been retired recently, 2 alleging low power prices

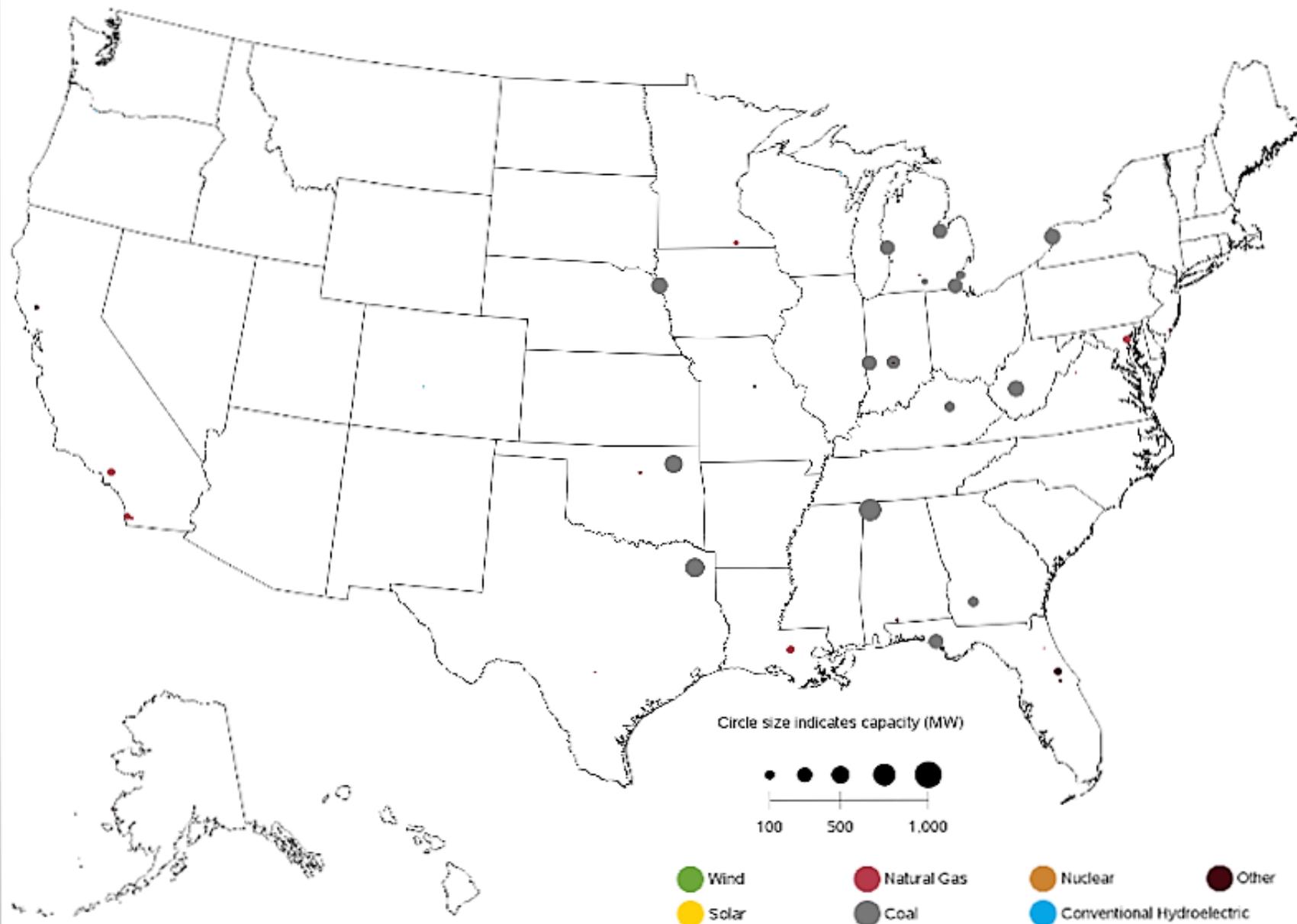


Figure 6.1.C. Utility-Scale Generating Units Planned to Come Online from March 2016 to February 2017



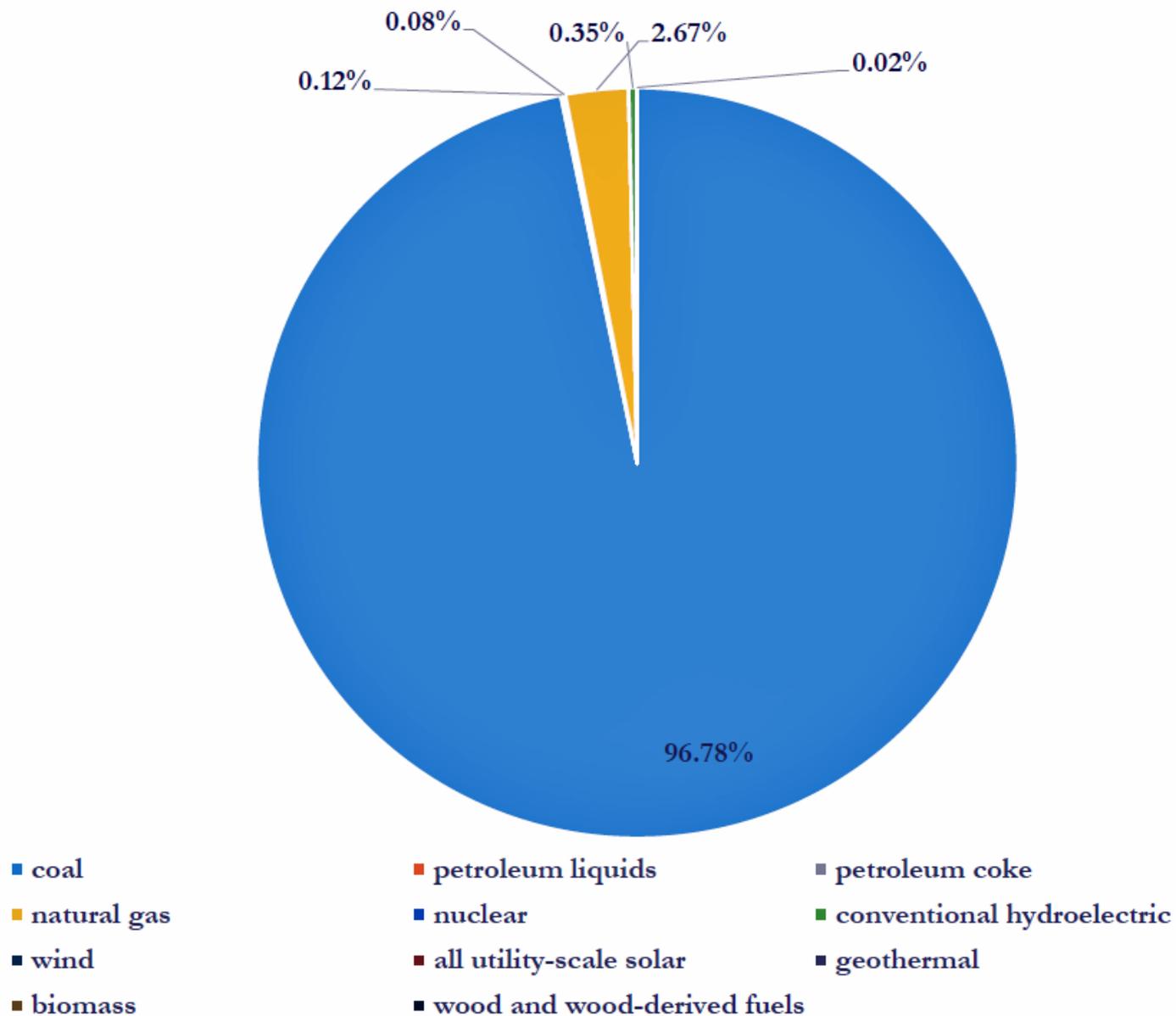
Sources: U.S. Energy Information Administration, Form EIA-860, 'Annual Electric Generator Report' and Form EIA-860M, 'Monthly Update to the Annual Electric Generator Report.'

Figure 6.1.D. Utility-Scale Generating Units Planned to Retire from March 2016 to February 2017

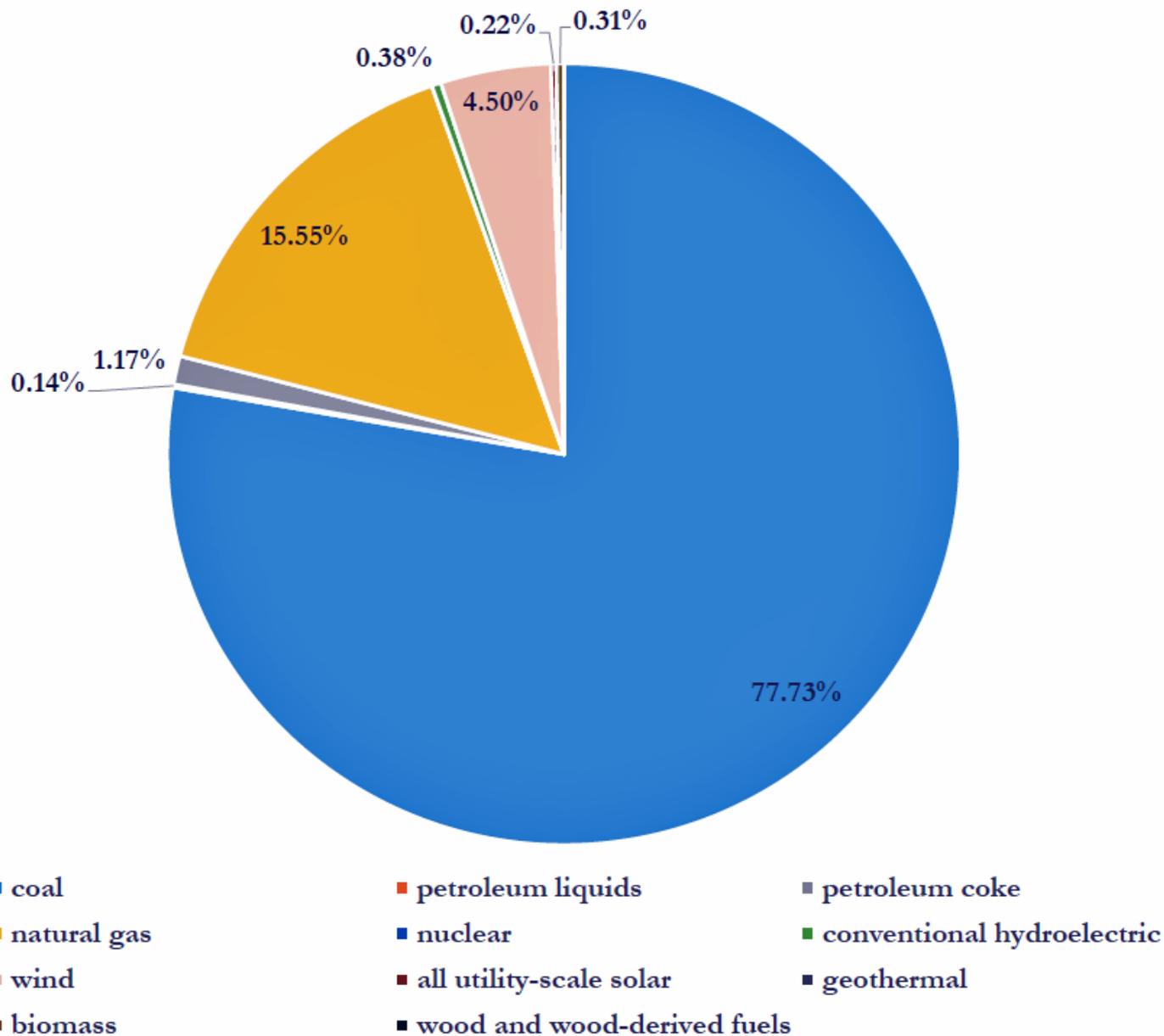


Sources: U.S. Energy Information Administration, Form EIA-850, 'Annual Electric Generator Report' and Form EIA-860M, 'Monthly Update to the Annual Electric Generator Report.'

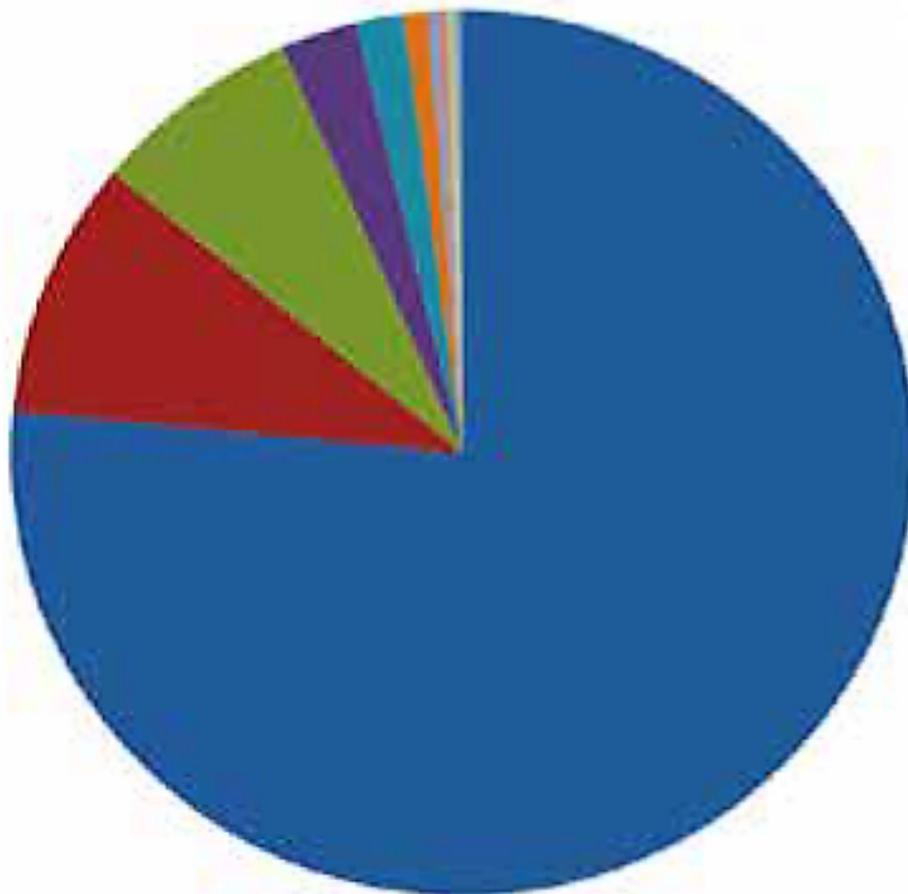
Indiana: Net generation for electricity from electric power sector (2005)



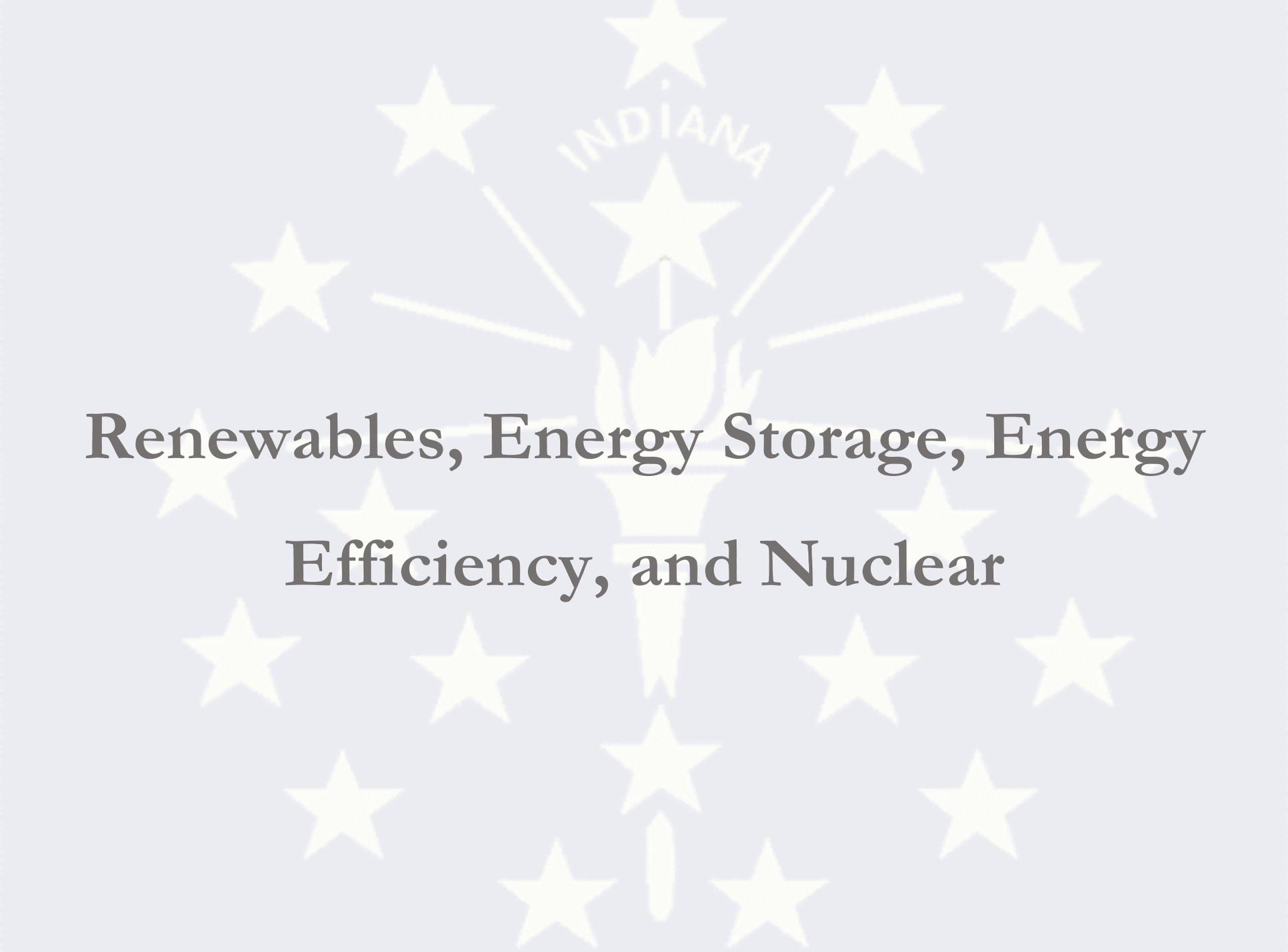
Indiana: Net generation for electricity from electric power sector (2015)



Projected Generation of Electricity by Fuel Type for Indiana Consumers for 2014

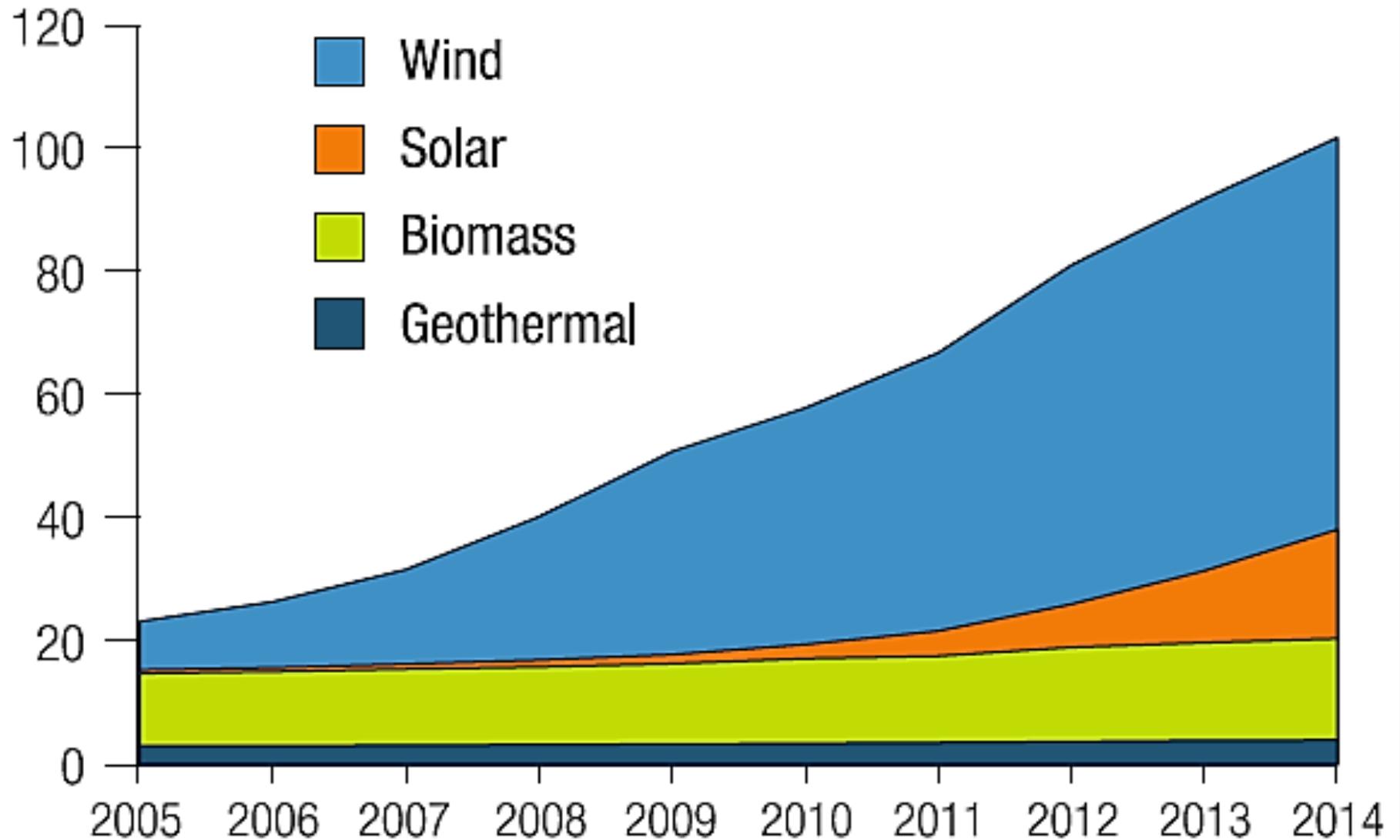


- Coal (97,729 GWH, 76.6%)
- Nuclear (12,003 GWH, 9.4%)
- Natural Gas (9,617 GWH, 7.5%)
- Wind (3,495 GWH, 2.7%)
- Other Gases (2,156 GWH, 1.7%)
- Pet Coke (1,140 GWH, 0.9%)
- Other (447 GWH, 0.4%)
- Biomass (385 GWH, 0.3%)
- Hydro (352 GWH, 0.3%)
- Oil (159 GWH, 0.1%)
- Solar (153 GWH, 0.1%)

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**Renewables, Energy Storage, Energy
Efficiency, and Nuclear**

United States Installed Renewable Capacity (2005-2014) (GW)

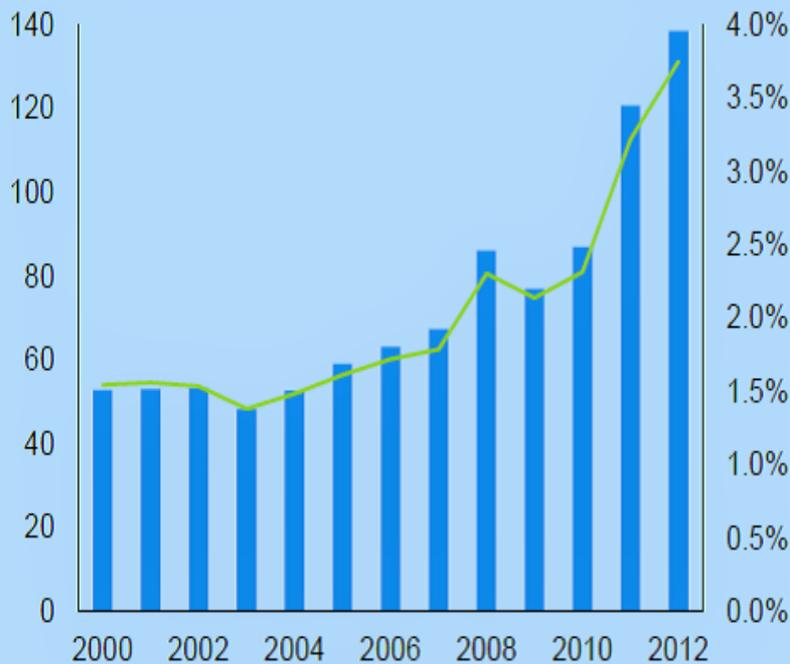


Grid-scale Energy Storage is Here Today!

- Energy storage is commercially viable today
 - ▶ As battery costs continue to decline, energy storage becomes even more competitive
- With energy storage, existing resources are better utilized which makes the grid more **resilient**, **efficient** and **clean**
 - ▶ Compliments and promotes use of renewables
 - ▶ Improves the efficiency of existing grid assets
 - ▶ Reduces costs and emissions

Energy Efficiency programs will continue to grow and be important

Energy Efficiency Savings – U.S., TWh



Energy Efficiency Savings – MISO States, TWh



■ U.S. Energy Efficiency Savings¹ (TWh)
 — U.S. Energy Efficiency Savings as a % of Retail Sales¹

■ U.S. Energy Efficiency Savings – MISO States² (TWh)
 — U.S. Energy Efficiency Savings as a % of Retail Sales – MISO States²

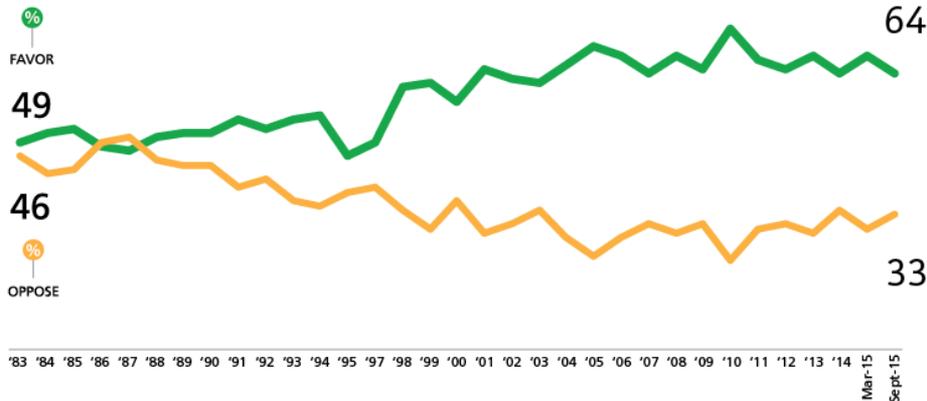
¹Energy Information Administration (EIA)

²EIA; Includes energy efficiency savings for entire state MISO participates in; Excludes KY, MT, and TX where MISO has a small footprint as a % of those states' loads

Public Favors Nuclear Energy, Recognizes Importance to Our Energy Future

Favorability to Nuclear Energy: Trend Up in Long-Term, Stable in Short-Term

Overall, do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose the use of nuclear energy as one of the ways to provide electricity in the United States?

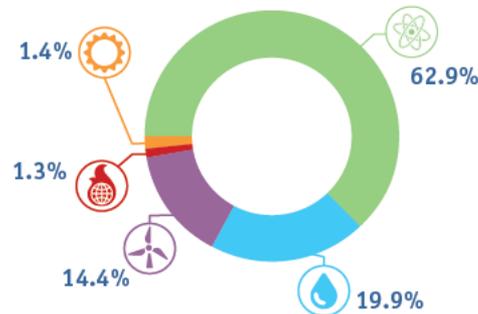


84%

believe nuclear energy is important for America's energy future.

Energy Fact

America's Low-carbon Electricity Sources

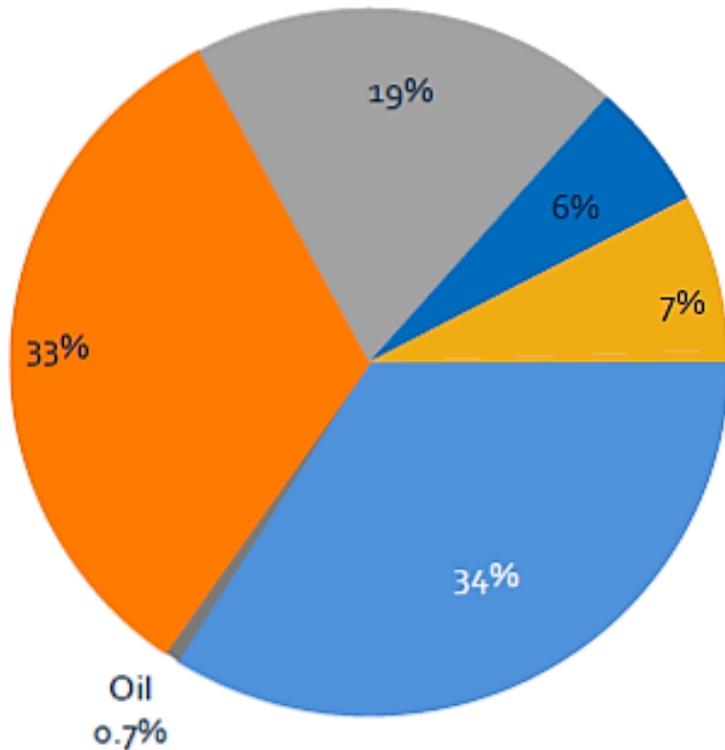


63%

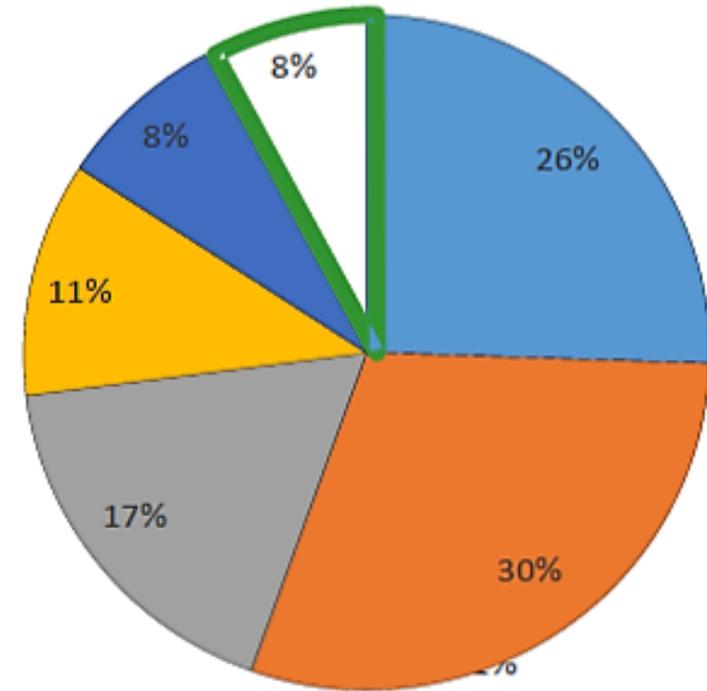
of America's low-carbon electricity is generated by nuclear energy.

Projected Fuel Mix from 2015 to 2030

2015 National Fuel Mix
(Estimate)



2030 National Fuel Mix
(EPA Mass-based Case- U.S.)



■ Coal ■ Gas ■ Nuclear ■ RE ■ Hydro/Other ■ EE

Indiana Office of Energy Development Grant Programs (2015-2016)

Community Conservation Challenge: assistance to non-residential projects that reduce energy consumption or generate power from alternate energy sources

Propane School Buses

Hoosier Homegrown Fuels Program: increases availability of higher ethanol blends in Indiana.

Wastewater Treatment Plants Program: funding for installation of efficient equipment and processes, anaerobic digesters, or waste-heat recovery

Summary

- Fuel and technology diversity produces least-cost power production mix – “All of the Above”
- Trends show coal’s share as fuel to generate electricity is declining
- Energy Storage is commercially viable today
- Energy Efficiency will be larger part of future
- Nuclear is carbon emissions-free
- OED grants promote LEDs and alternative fuels

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Questions?

Senator Jim Merritt

Chairman, Senate Utilities Committee

Phone: 800-382-9467 or 317-232-9400

Email: Senator.Merritt@iga.in.gov