# AES's U.S. Coal Plant Risks

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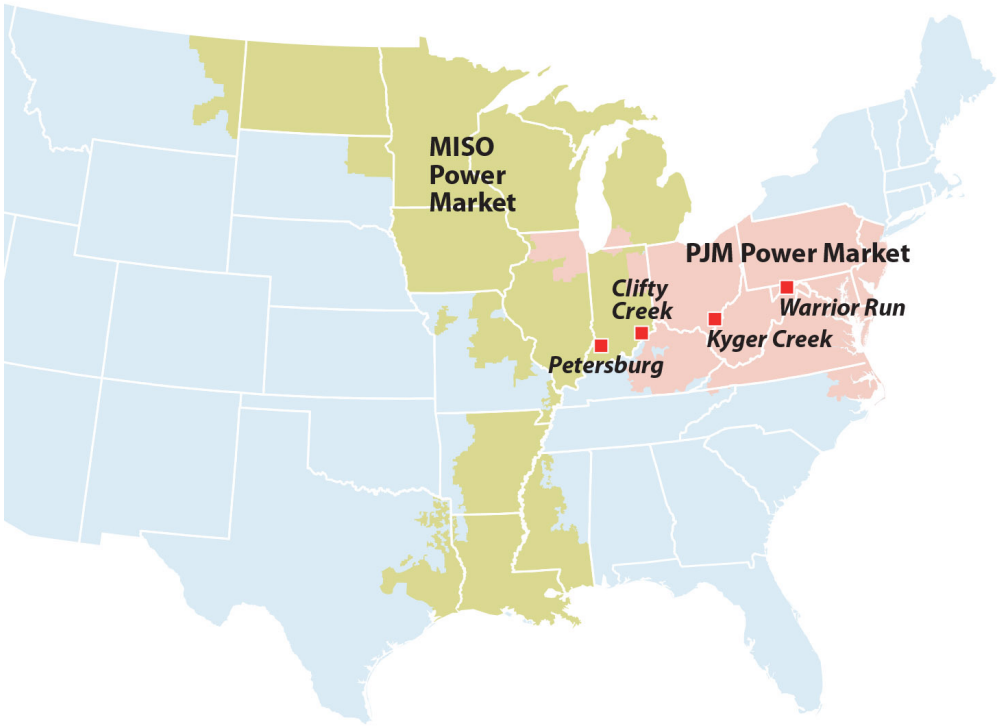
# Introduction (1)

- AES Corp., or its subsidiaries, own seven coal-fired generators in the U.S, in whole or in part.
  - Petersburg Units 1-4
  - Clifty Creek
  - Kyger Creek
  - Warrior Run
- These units are located in two of the competitive wholesale markets in the country. The Midcontinent Independent System Operator (MISO) and the PJM Interconnection (PJM).
- Two of these units, Petersburg 1 and 2, are scheduled to be retired in 2021 and 2023.
- AES owns 100% of Warrior Run and 82% of the Petersburg units. It also owns 4.9% of Clifty Creek and Kyger Creek.




AES also owns coal units in Hawaii and Puerto Rico. Its 180 MW unit in Hawaii is scheduled to retire in September 2022. AES's 450 MW unit in Puerto Rico may be forced to retire by a state law that mandates no coal starting in 2028.

# Introduction (2)

- AES also owns coal units in Hawaii and Puerto Rico. Its 180 MW unit in Hawaii is scheduled to retire in September 2022.
- AES's 454 MW unit in Guayama, Puerto Rico has a contract to sell power to the Puerto Rico Electric Power Authority (PREPA) but may be forced to retire by a state law that mandates no more coal generation on the island after that contract ends in 2027
- The unit also has serious coal ash problems. The current location where coal ash is deposited is an open-air dump that has been contaminating the groundwater for years. Post Hurricane Maria, some of the coal ash was shipped to a landfill in Florida but that was stopped. The existing contamination is a huge liability going forward.
- AES also owns a lot of gas-fired capacity in the U.S.
  - According to the company's most recent 10-K filing with the U.S. Securities & Exchange Commission, AES, and its subsidiaries, owned nearly 10,000 MW of capacity in the U.S. at the end of 2019. This included over 2,700 MW of coal-fired and over 4,000 MW of gas-fired capacity, with the remainder being wind, solar and storage (and a bit of oil).

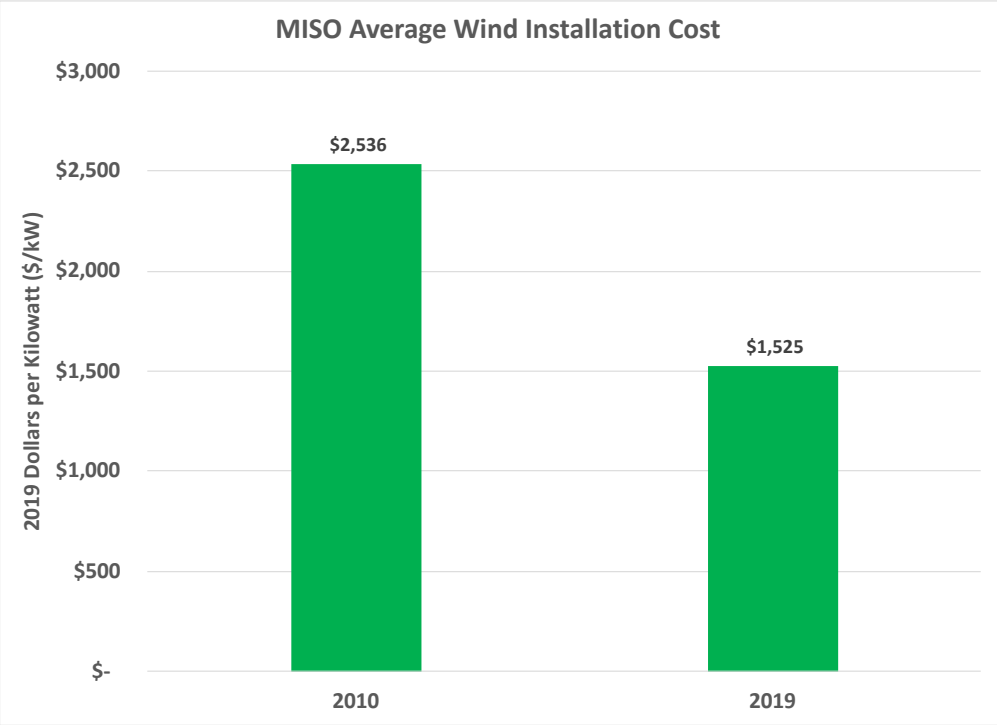
# Coal-Fired Generators in the PJM and MISO Wholesale Markets Face Significant Risks

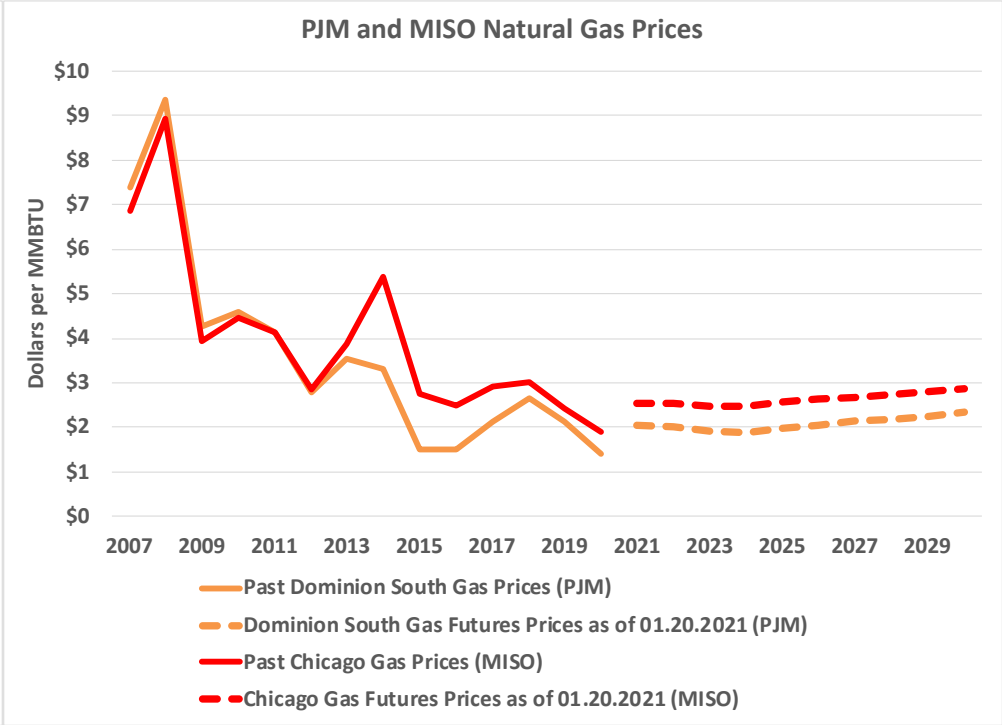
- Growing competition from wind & solar.
- Continued low natural gas prices.
- Low gas prices and increased competition from renewables means less generation from coal-fired plants and lower revenues from sales.
- Low and/or volatile capacity market prices.
- An aging coal fleet.
- Flat or nearly flat peak demands (MW) and energy loads (MWh) – *means increased competition to serve same sized loads.*
- The potential for state or federal actions to phase out of fossil fuels or transition to renewables at a faster rate.

# These Risks Have Led to the Retirement of Many Large Coal-Fired Generators and More Will Be Retired in Coming Years

- The peak of coal-fired capacity was 317.64 Gigawatts in 2011.
- By the end of October 2020, coal-fired capacity in the U.S. stood at 221.25 GW – down 30.3% from 2011.
- IEEFA estimate is that as of the end of 2020, U.S. coal-fired capacity declined to 216.15 GW, down 32% from 2011.
- Estimate is that more than 65 GW of coal-fired capacity will be retired by 2030. Remaining coal-fired capacity will be down more than 53% from 2011.
- MISO has said that a total of 23.5 GW of capacity has been retired since 2005 and that 73% (or 17 GW) of this was coal-fired.
- Coal-fired capacity in PJM has declined from 67.3 GW at end of 2005 to 49.7 GW as of September 30,2020 – a decline of 17.6 GW or 26%.

# Wind Installation and Natural Gas Prices Have Fallen Substantially in Recent Years

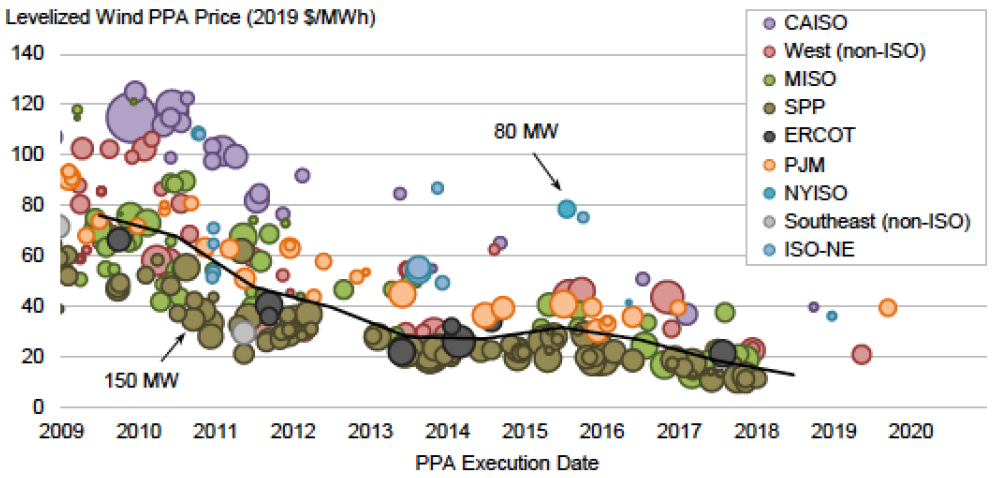


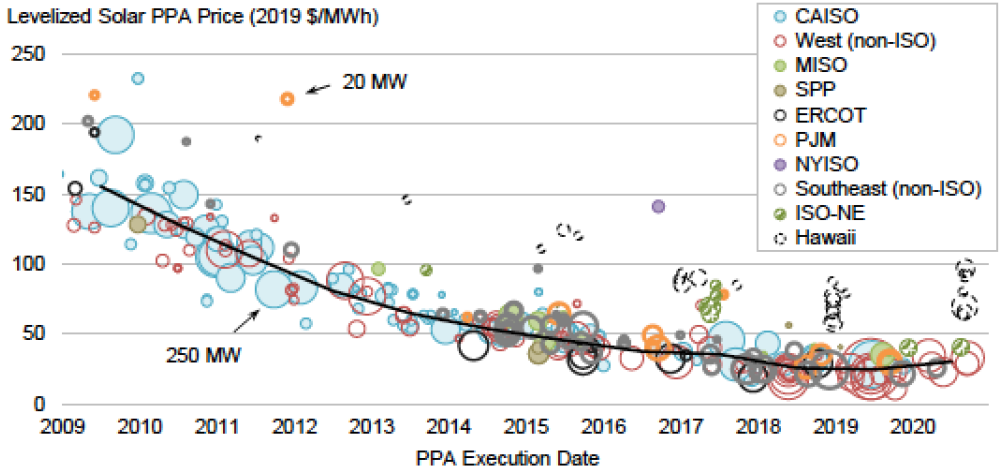

Wind installation prices also fell in PJM but that hasn't led to meaningful increase in installed wind capacity.

# Average Prices for Utility-Scale Wind & Solar PPAs Have Declined by ~80% in Last Decade

## Wind PPA Prices




## Utility-Scale PV PPA Prices

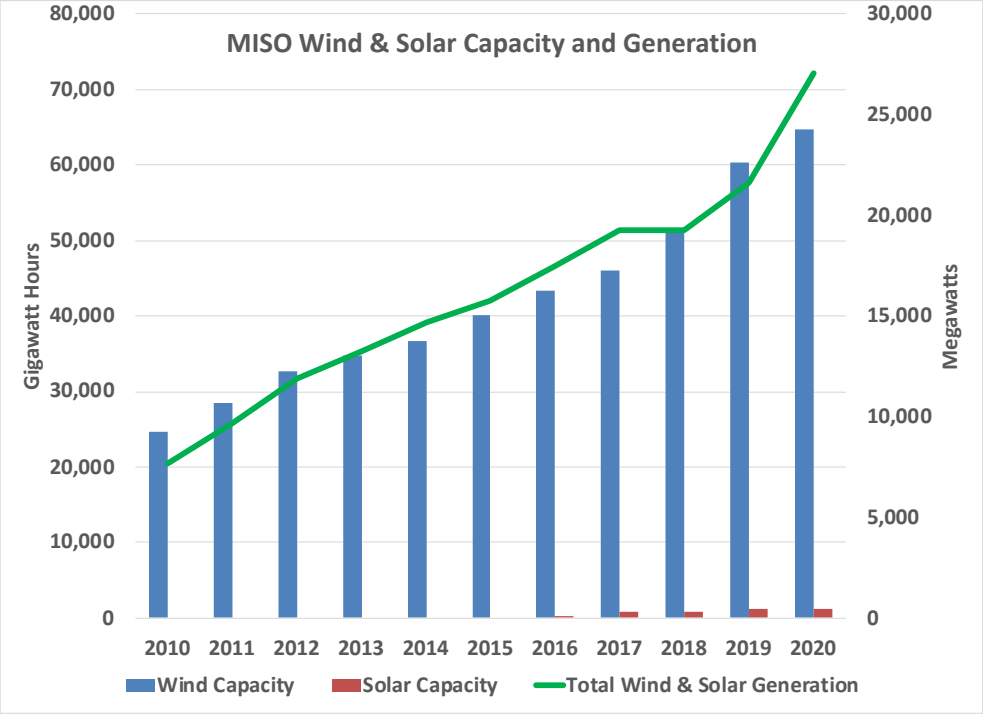


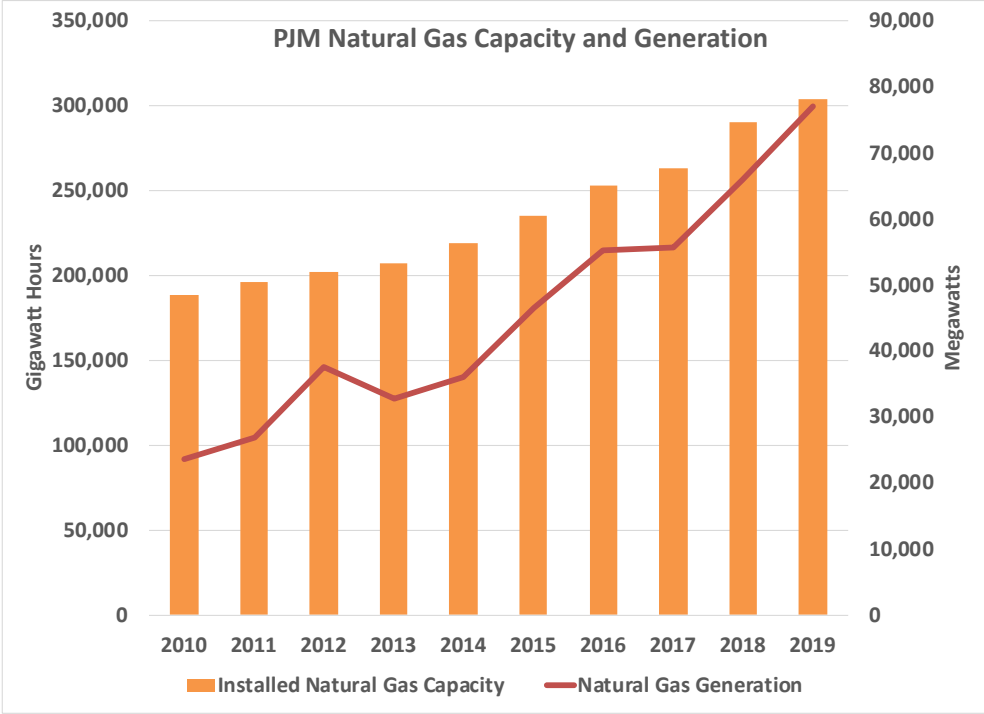

- Bubbles show levelized PPA prices by contract execution date (bubble size denotes PPA capacity)
- The black lines through the bubbles show generation-weighted average trend lines by calendar year
- Since 2009, average PPA prices have declined by ~80% for both wind and solar

Lawrence Berkeley National Laboratory 18

Source: Law Berkeley National Laboratory "Utility-Scale Wind and Solar in the U.S.: Comparative Trends in Deployment, Cost, Performance, Pricing and Market Value," December 8, 2020

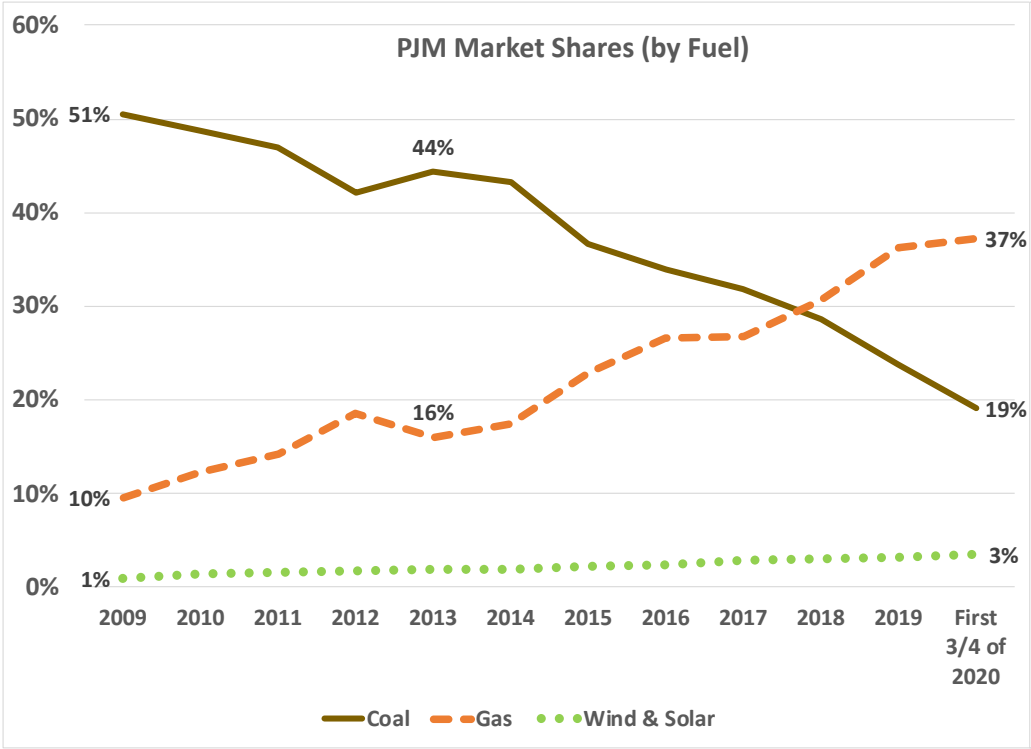
# Cost Declines Have Led to Dramatic Growth in Wind Capacity and Energy in MISO and Significant Increase in Gas Capacity and Energy in PJM

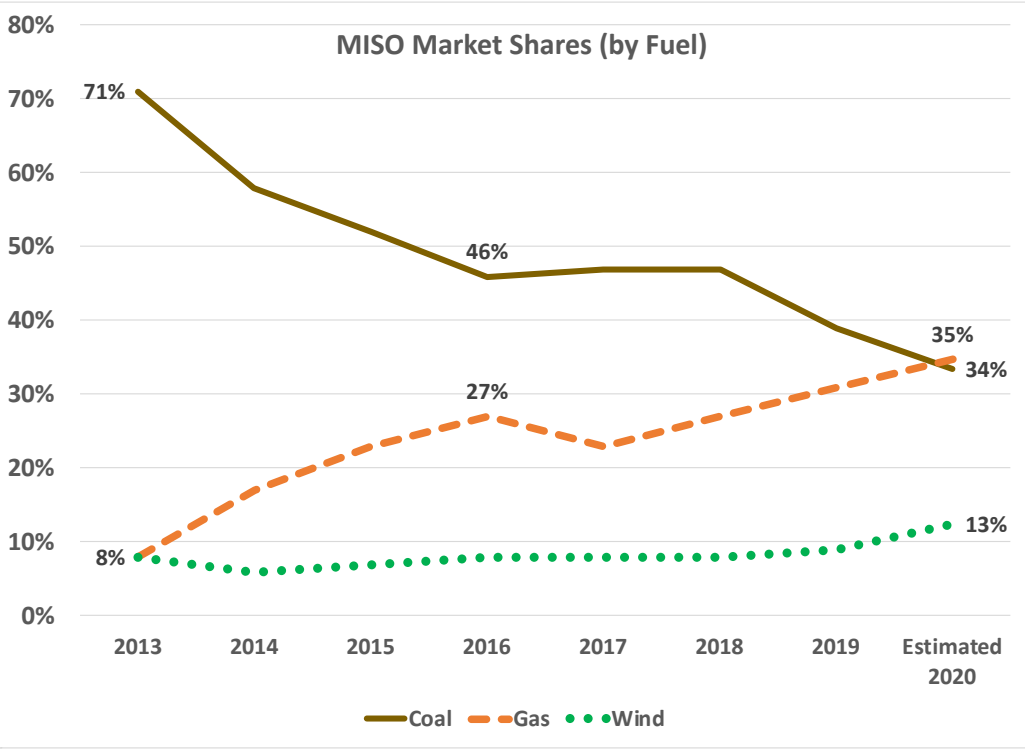



Wind capacity in PJM and gas capacity in MISO didn't increase much at all during this period although the existing gas capacity in MISO generated more energy.

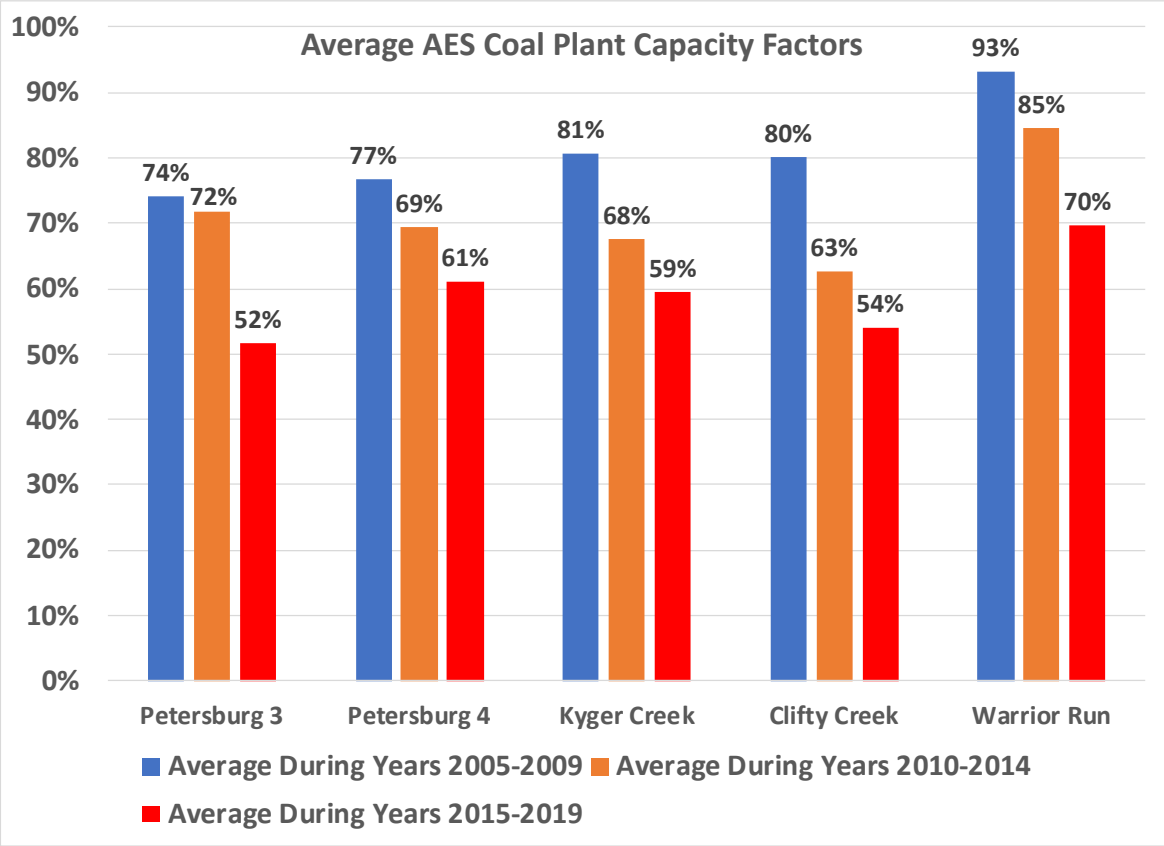
# As a Result, Wind and Gas Market Shares Have Increased in PJM and MISO While Coal's Market Share Has Fallen



# The Generation at AES's Coal-Fired U.S. Units Has Declined Significantly Over the Past 15 Years

- A power plant's capacity factor is the ratio of how much energy the plant has generated during a given period (generally a month, year, or series of years) versus the maximum amount of energy it would have produced if it had run at 100% power for all the hours in the period. The higher, the better




Capacity factors have been even lower in first 11 months of 2020:

Petersburg 3 – 31%

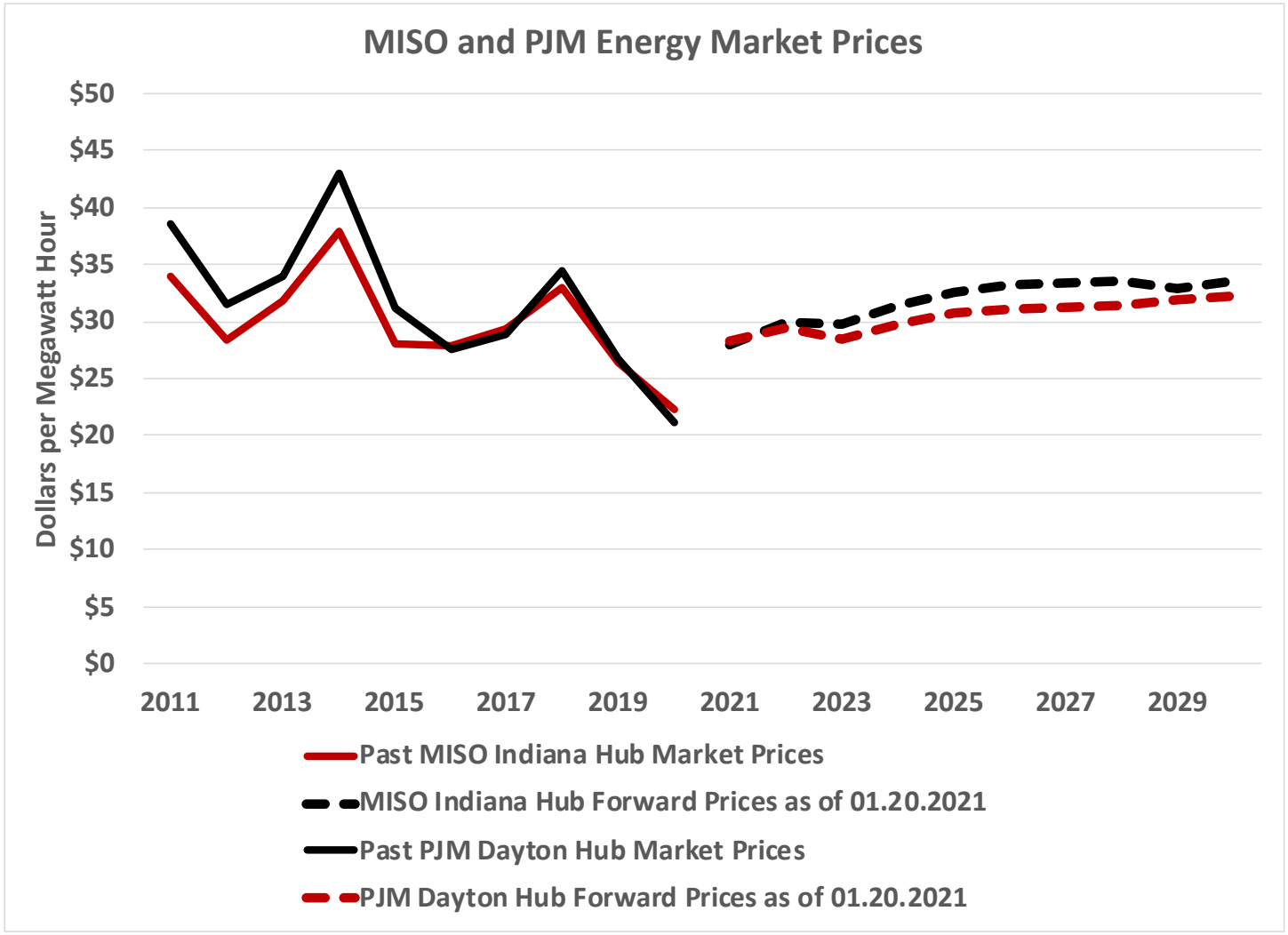
Petersburg 4 – 43%

Warrior Run – 59%

Clifty Creek – 40%

Kyger Creek – 51%

# Energy Market Prices in PJM and MISO Have Generally Been Low and Are Expected to Remain That Way



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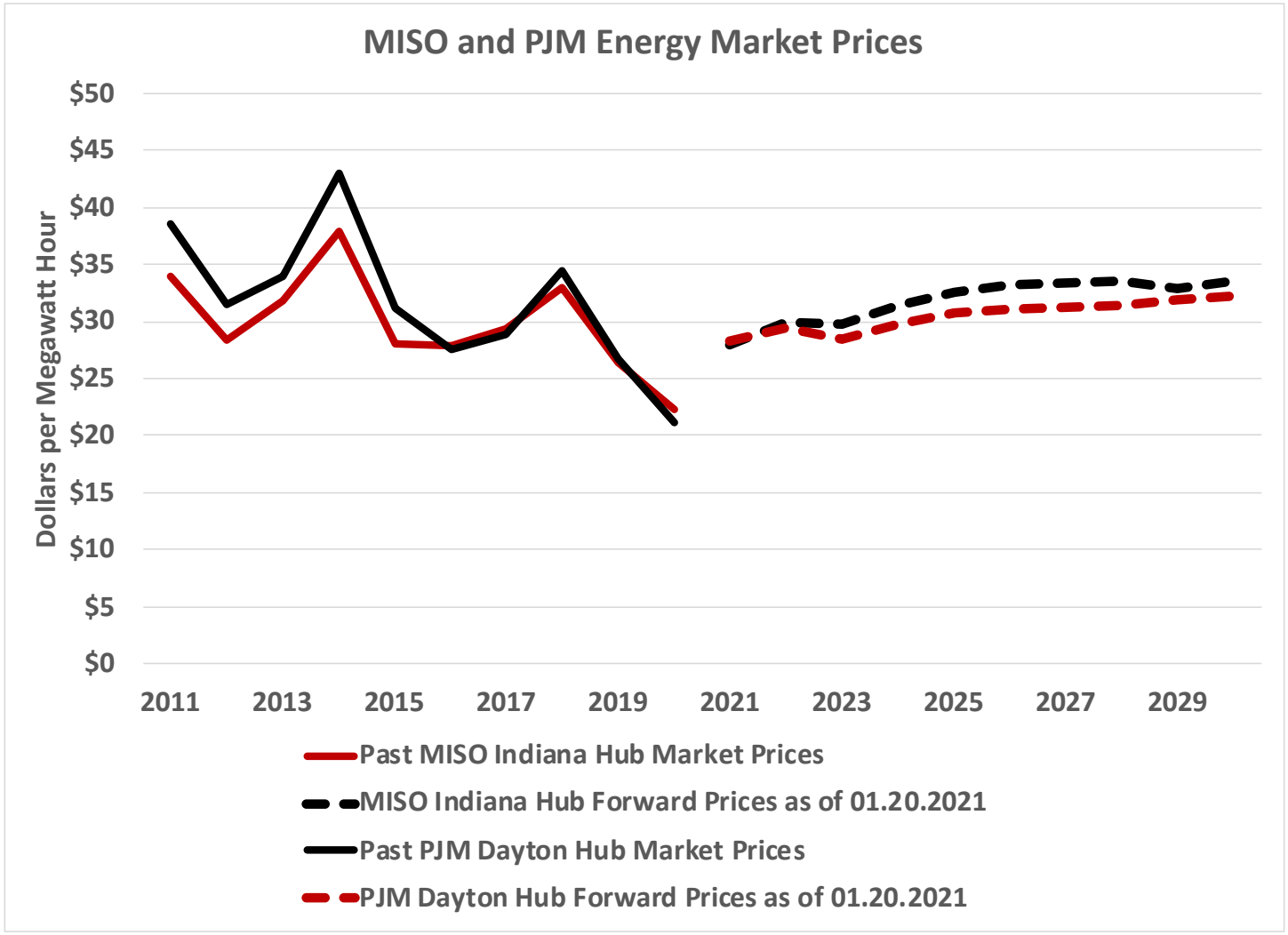
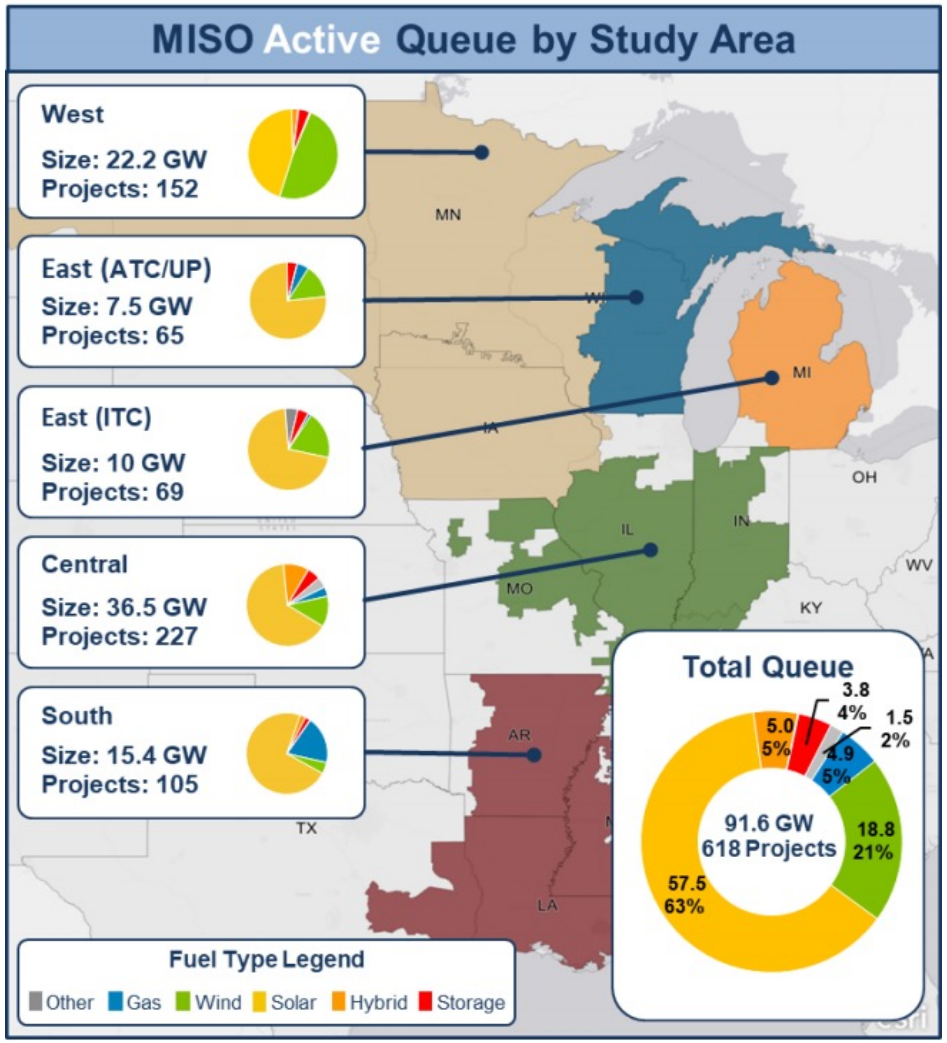
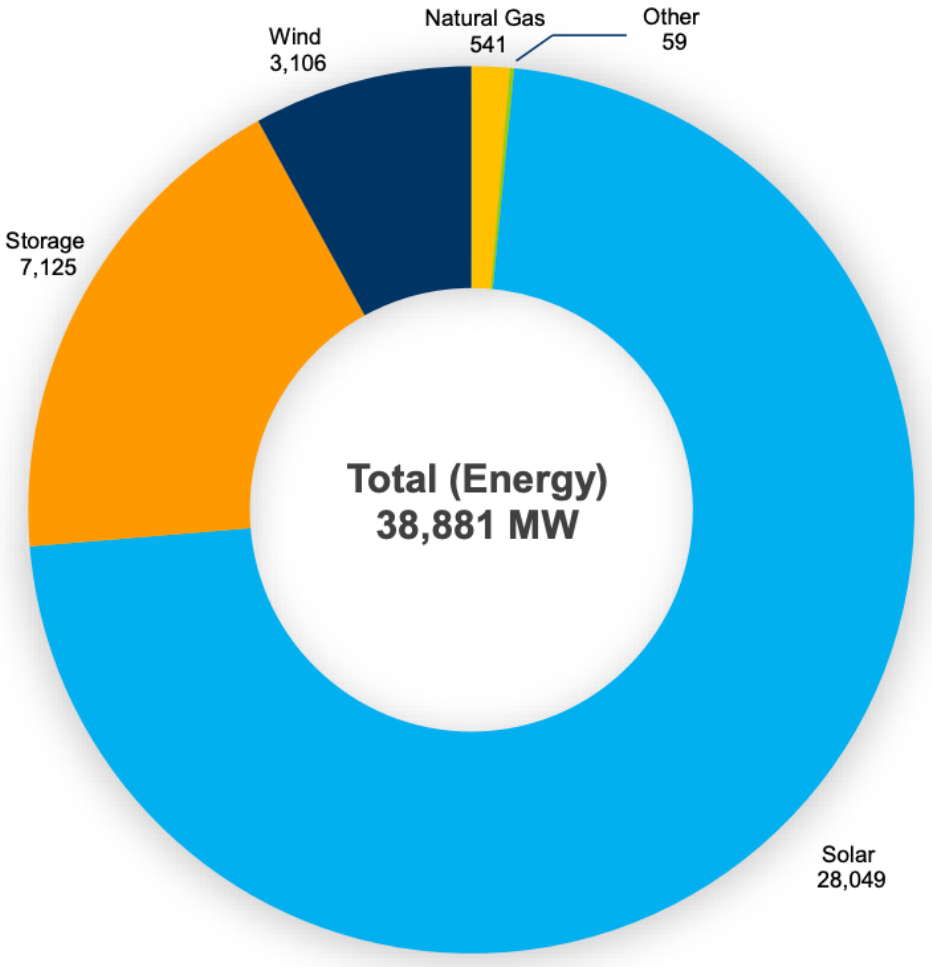


# More Renewable Resources and Storage Are On the Way

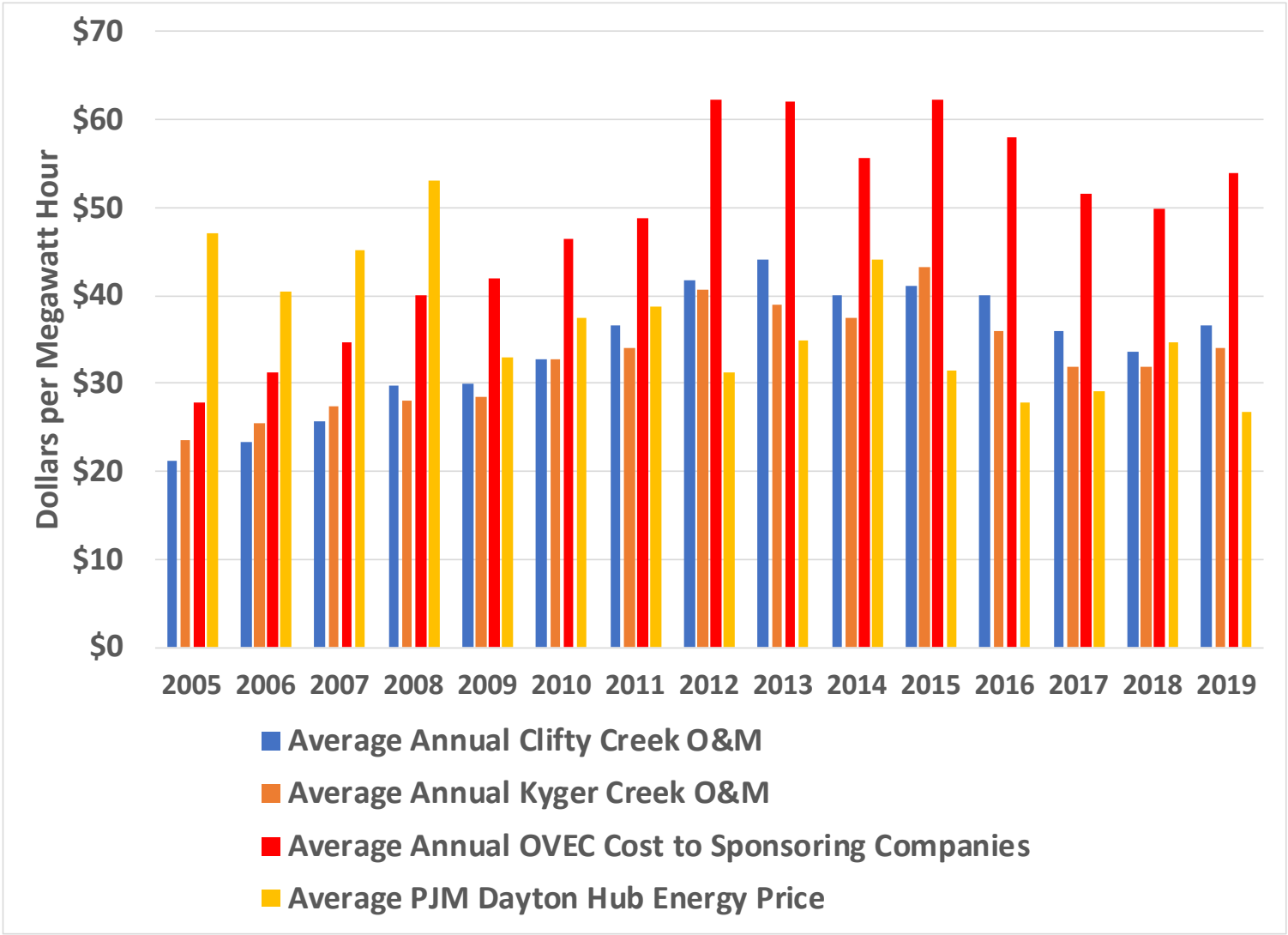
MISO Generator Interconnection: Overview Queue as of 02.01.2021



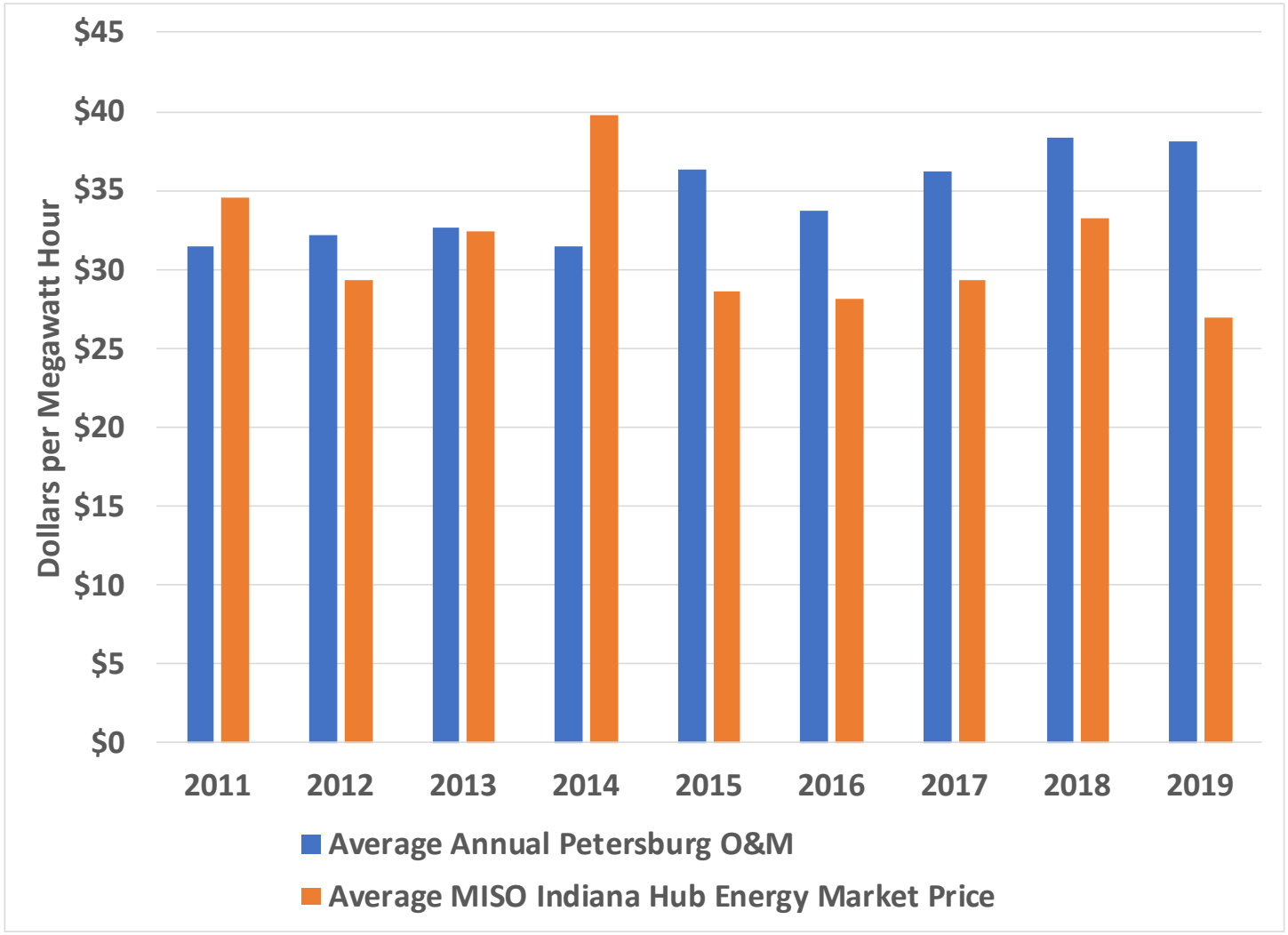

PJM Interconnection Queue Status Update as of 11.04.2020



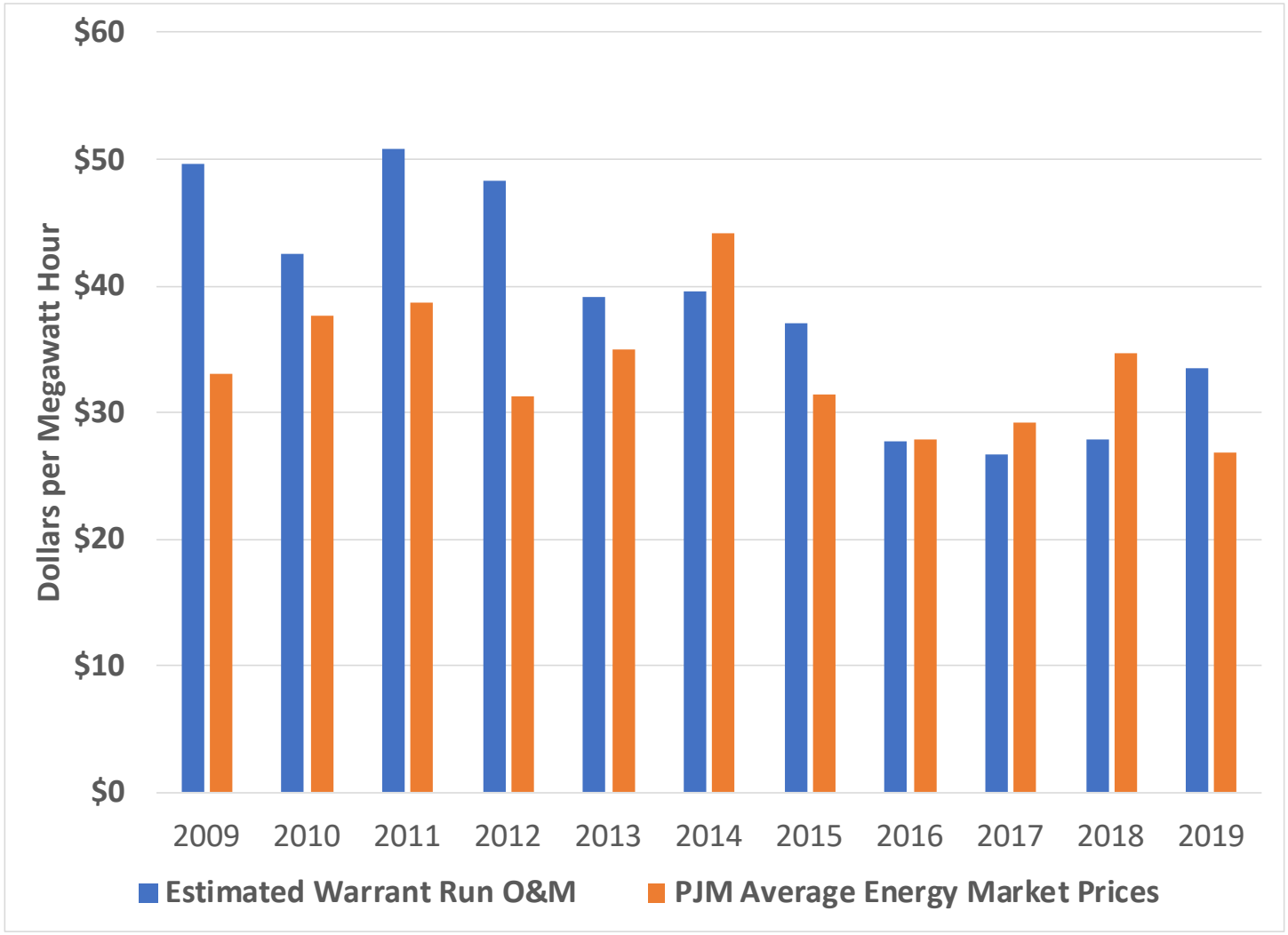
# Cost of Power from Clifty Creek and Kyger Creek vs. Annual Average Energy Market Prices at PJM Dayton Hub



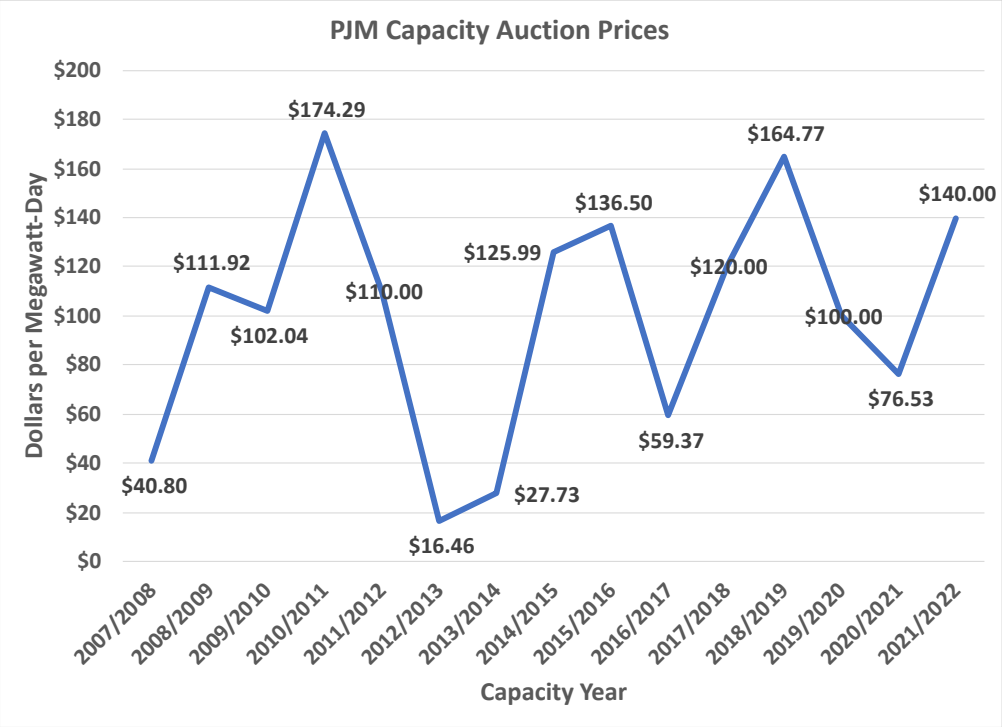
# Cost of Power from Petersburg vs. Annual Average Energy Market Prices at MISO Indiana Hub

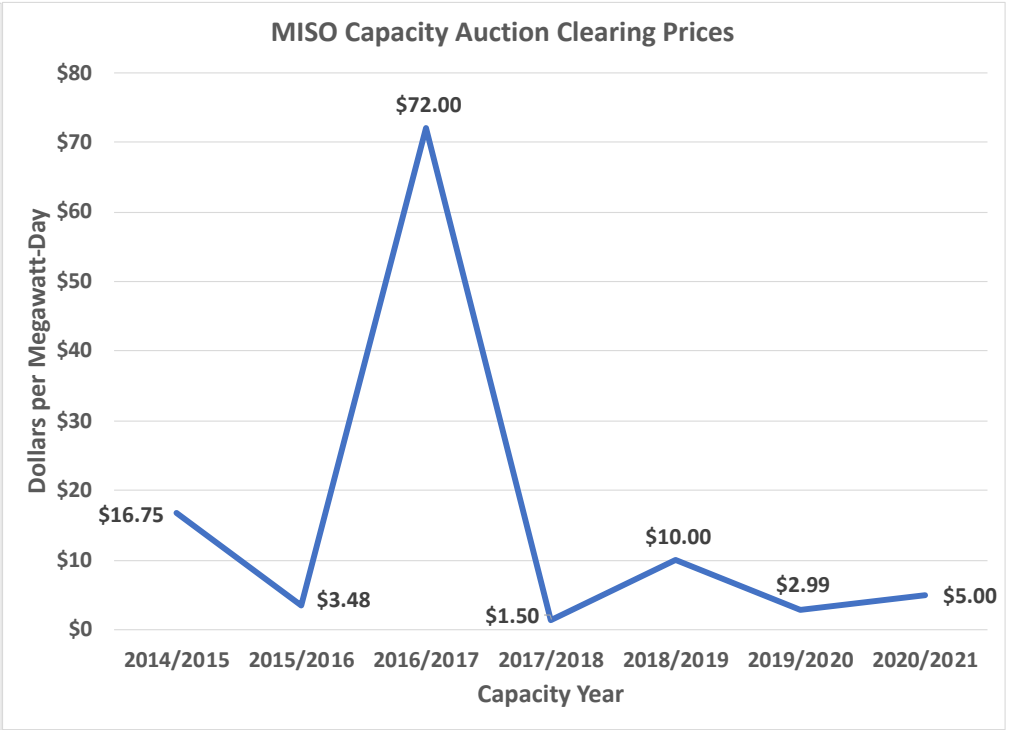


# Estimated Cost of Power from Warrior Run vs. Annual Average PJM Energy Market Prices



# MISO and PJM Capacity Prices Have Been Low and/or Volatile




The MISO auction is for the immediately following capacity year while the PJM auction is a three-year look ahead. That means that the auction for capacity year June 1, 2019 to May 31, 2020 was conducted in 2016. PJM has had a lot of discord in recent years about how to handle renewable resources that may be receiving state subsidies.

It also is unclear which, if any, of AES's units have cleared the PJM auction.

# The Risk of Coal Plant Aging

- The ages of AES's coal-fired generators in 2020 were:
  - Warrior Run – 20 (AES share 229 MW nameplate capacity)
  - Kyger Creek – 65 (AES share 53 MW)
  - Clifty Creek – 64-65 (AES share (64 MW)
  - Petersburg 1 – 53 (AES share 232 MW)
  - Petersburg 2 – 51 (AES share 431 MW)
  - Petersburg 3 – 43 (AES share 553 MW)
  - Petersburg 4 - 34 (AES share 553 MW
  - The peak of coal-fired capacity was 317.64 Gigawatts in 2011.
- In general, older coal plants tend to cost more to operate and maintain and are less reliable. Also, plant heat rates tend to increase meaning plants less efficient.

# For More Information

## Contact

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