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Hearing before the Pennsylvania Bicameral Nuclear Energy Caucus

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C2ES CENTER FOR CLIMATE AND ENERGY SOLUTIONS

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About Center for Climate and Energy Solutions

- **Independent, nonpartisan, nonprofit organization**
- **Mission: To advance strong policy and action to reduce greenhouse gas emissions, promote clean energy, and strengthen resilience to climate impacts.**
- **Brings city, state, and national policymakers together with businesses and other stakeholders.**
- **Ranks regularly among the top environmental think tanks in the world.**

Climate Challenge – Deep Decarbonization

- Decarbonization strategies

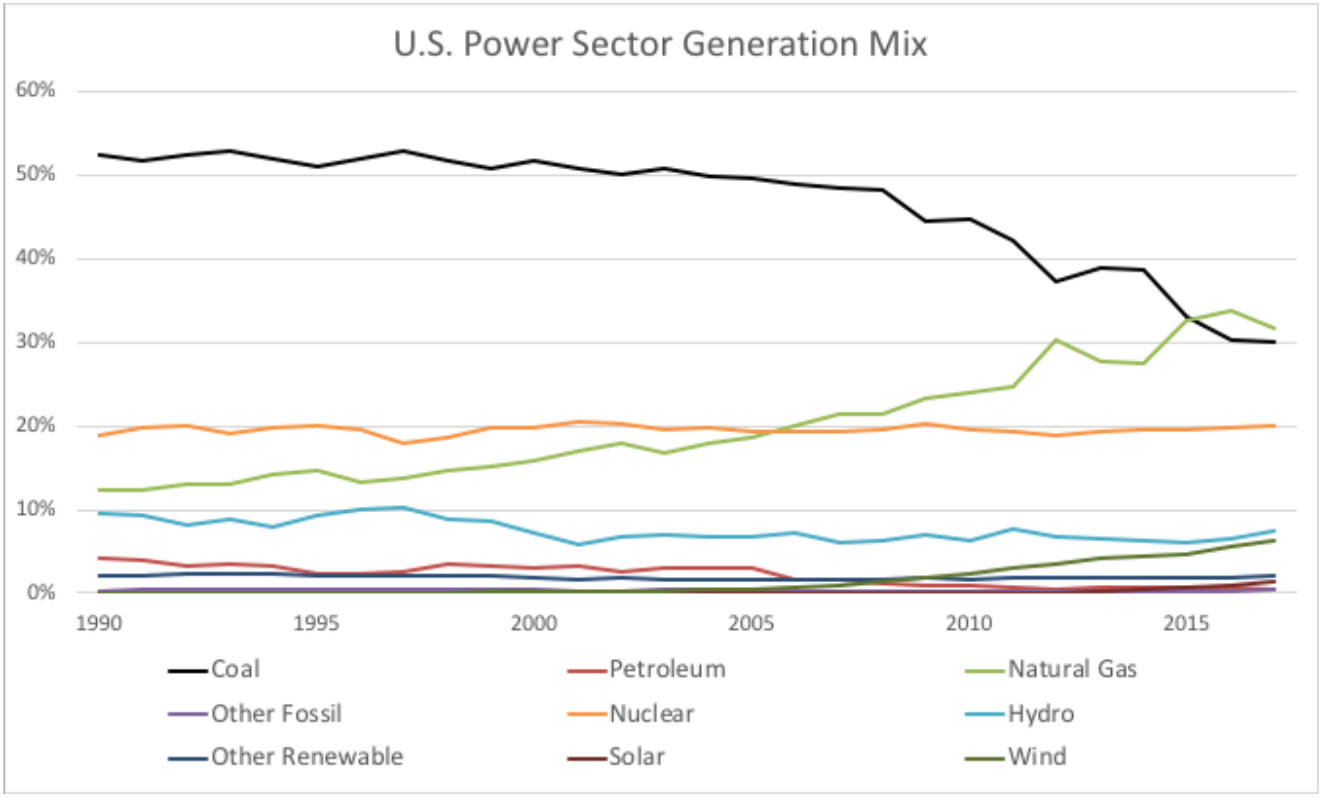
Energy-Efficiency	Energy Supply Decarbonization	Fuel Switching
Making final energy consumption more efficient in buildings, industry and transport.	Low-carbon electricity generation mixes that include renewable, nuclear, and fossil with CCS. Pipeline gas supply and liquid fuels decarbonization.	Electrifying end-uses and greater use of low-CO_2 alternatives like hydrogen where possible.

Source: U.S. Deep Decarbonization Pathways, E3, LBNL, PNNL, 2015.

- Mid-century goal – reduce U.S. emissions 80 percent
- Carbon budget
- April 2018 – 410 parts-per-million (ppm)

Nuclear Power Benefits

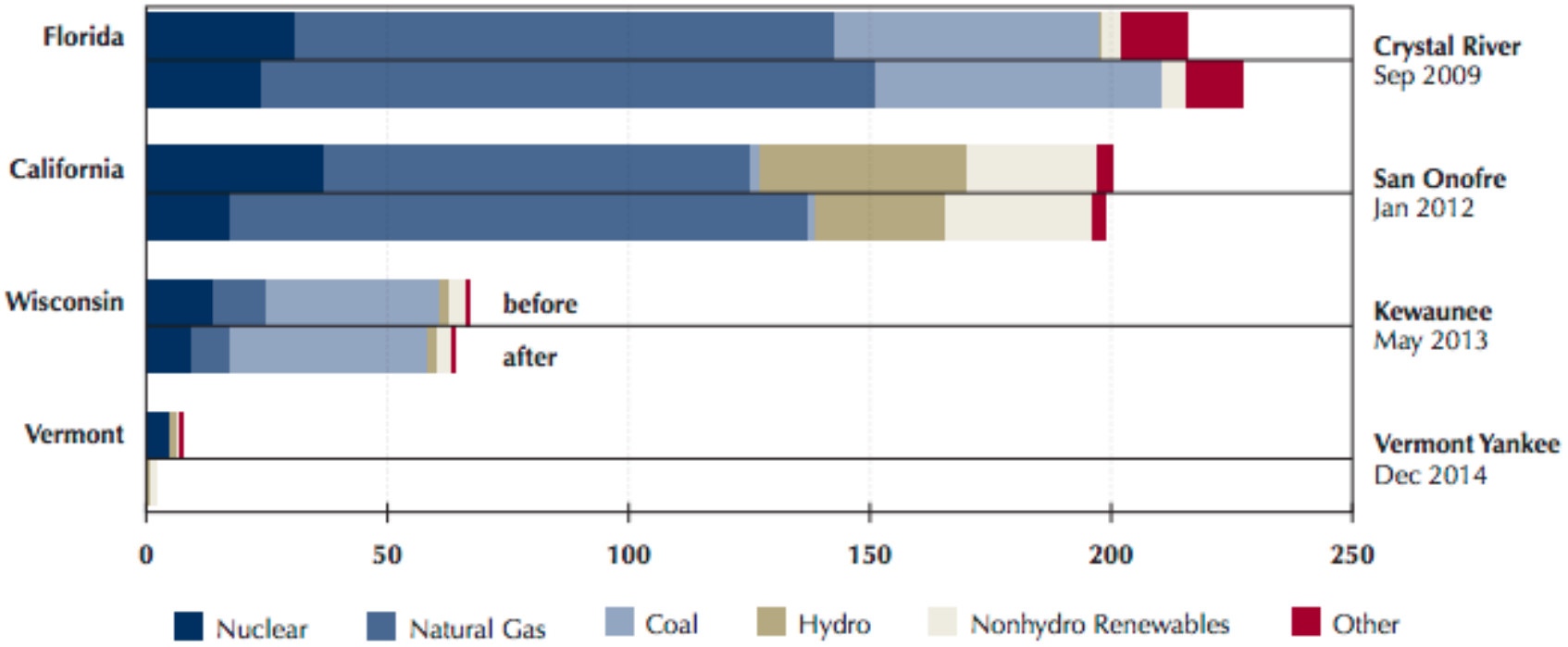
- U.S. nuclear fleet avoids annual emission of at least 400 $MMtCO_2e$
- Nuclear power plants emit no SO_x, NO_x, or PM
- Reliability, fuel diversity, small footprint, and rural jobs



Early Retirement Effects

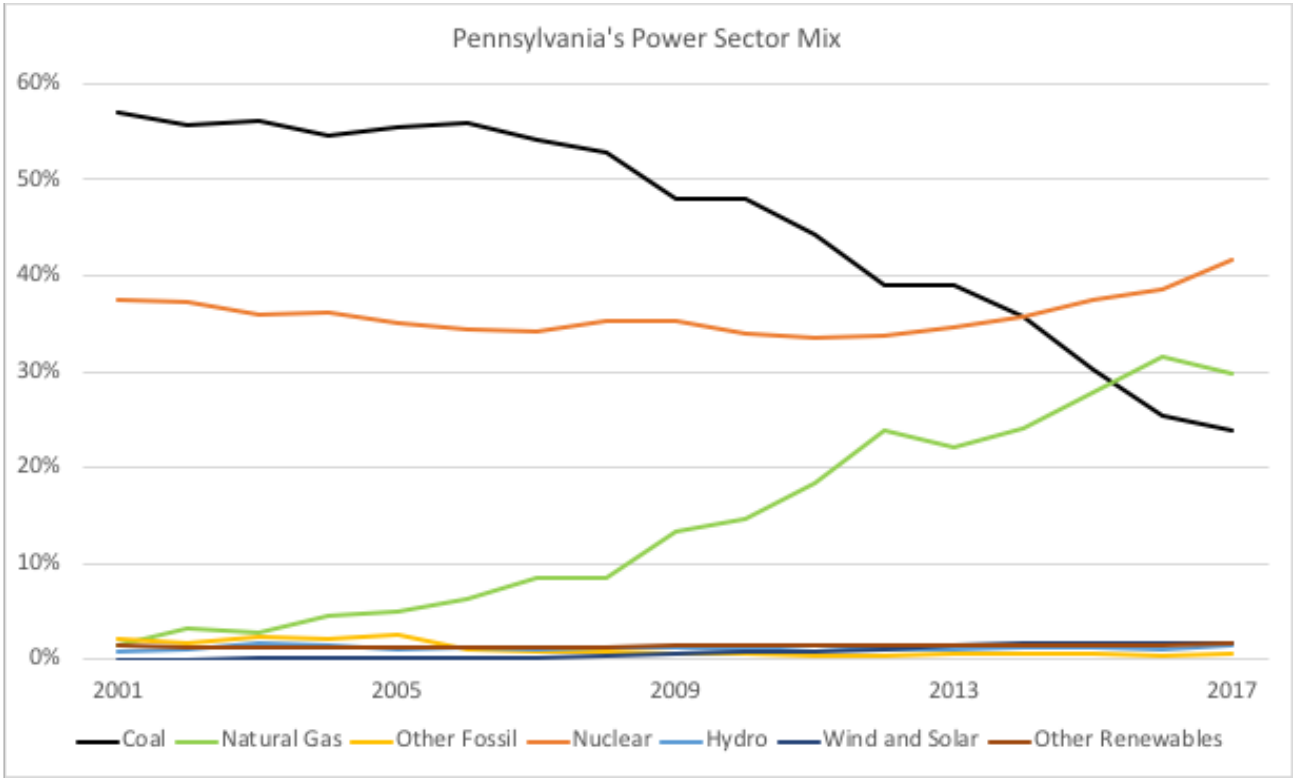
- In-State Electricity Generation in 12-month periods before and after nuclear retirements (billion kilowatt hours)

- California in-state electric power sector emissions rose by 10 million metric tons the year after San Onofre retired; as of 2015 they are still 9 million metric tons (21 percent) above the 2011 low. In Wisconsin, coal-fired generation largely replaced the missing electricity from the retired Kewaunee Power Station.

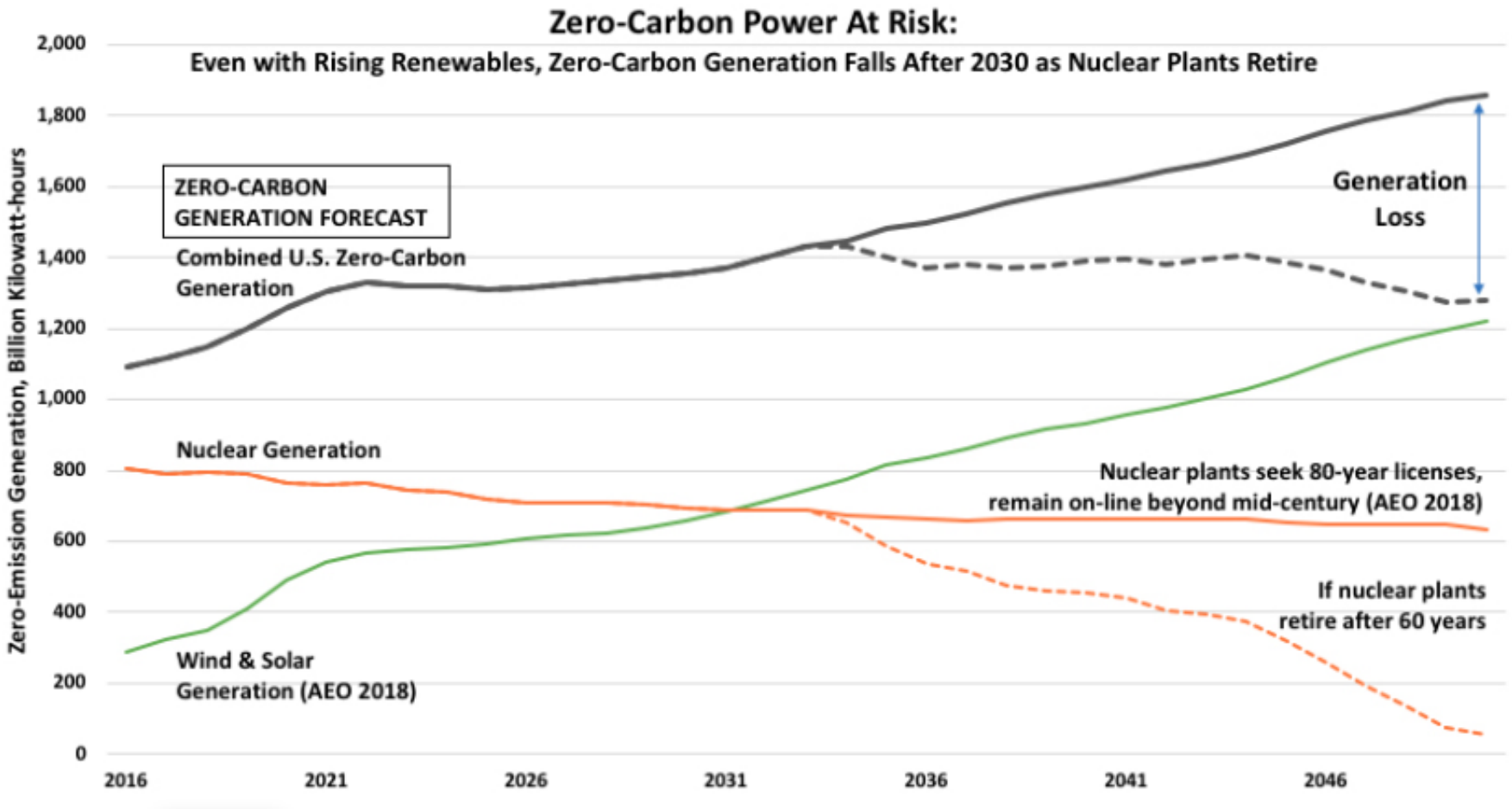


Pennsylvania Electricity Mix

- Pennsylvania's 5 nuclear plants provided more than 40 percent of in-state electricity last year, and 90 percent of its zero-emission generation
- Beaver Valley and TMI generate around 22 TWh of zero-emission electricity, avoiding around 10 MMtCO2e annually.



Zero-Emission Coalition



State Actions – Expeditious, Justifiable

- Federal government (e.g., Congress, FERC, EPA, DOE) are looking into remedies, but action is not expected soon.
- 5 plants have retired already, 9 plants are scheduled to retire by 2025 – a palpable sense of urgency
- Actions by states (e.g., NY, IL, and NJ) are justifiable
  - Zero-emission credit (ZEC)
    - Represents the environmental benefit of 1 MWh of carbon dioxide free generation from an eligible nuclear power plant.
    - Remedy a market failure (e.g., markets do not compensate for environmental benefit of nuclear power plants)
    - Have withstood early legal challenges, are supported by FERC

Bio

Doug Vine

Senior Energy Fellow

Doug Vine is a Senior Energy Fellow at the Center for Climate and Energy Solutions (C2ES). He supports the center's work on global and domestic energy production and utilization. Additionally, he focuses on topical energy issues including electric power, natural gas, and oil market developments.

Mr. Vine previously worked at Meridian Energy, New Zealand's largest electricity generator. He also worked for Genscape and Thomson Reuters Point Carbon, where he focused on U.S. regional electricity markets.

Mr. Vine holds an M.B.A from the Victoria University of Wellington. He also holds a Master of Science in systems engineering from Virginia Tech and Bachelor of Science in aerospace engineering from the University of Maryland.

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