The Nuclear Power Dilemma:
Declining Profits, Plant Closures, and the Threat of Rising Carbon Emissions
Global total net CO₂ emissions

Billion tonnes of CO₂/yr

In pathways limiting global warming to 1.5°C with **no or limited overshoot** as well as in pathways with a **high overshoot**, CO₂ emissions are reduced to net zero globally around 2050.

Four illustrative model pathways

- P1
- P2
- P3
- P4
Falling natural gas and renewables prices are challenging the economics of existing nuclear.
17 states have nuclear plants that are unprofitable or scheduled to close.
State subsidies in IL, NY and NJ

Average Annual Operating Margin, \(2017\)–\(2022\)

- Clinton
- Quad Cities
- Fitzpatrick
- Nine Mile Point
- Ginna
- Hope Creek
- Salem

- Without Subsidies
- Including Subsidies
Impact of Proposed subsidies in OH & PA

Average Annual Operating Margin, 2018-22 (2017$ per MWh)

- Without Subsidies
- With Proposed Subsidies

- Davis-Besse (OH)
- Perry (OH)
- TMI (PA)
- Beaver Valley (PA)
- Susquehanna (PA)
- Limerick (PA)
- Peach Bottom (PA)
Scenarios

- Reference Case
- Early Nuclear Retirements Cases
- National Carbon Price
- National Low Carbon Electricity Standard
Policy Recommendations

- Carbon price
- Low carbon electricity standard
Conditions for Financial Support

1. Ensure reactors meet strong safety standards
2. Require companies to open up books
3. Limit and adjust financial support over time
4. Strengthen renewable and efficiency standards
5. Develop worker and community transition plans
U.S. Electricity Mix in 2050 with Deep Decarbonization
Extra Slides
Capital costs for new nuclear plants

(2017$/kW)

Overnight Capital Cost for New Nuclear Plants

Capital Cost with Financing for New Nuclear Plants
Overnight capital costs for new nuclear plants (2017$/kW)
Natural gas prices, nuclear costs, and CO₂ prices have a big impact on profitability.
Public health and climate benefits exceed the costs

Cumulative Billion 2017:
- Public Health and Climate Benefits
- Electricity System Costs
- Carbon Revenue
- Net Benefit

Carbon Price          LCES
Natural gas and renewables have expanded rapidly over the past decade.

U.S. Electricity Generation

2007:
- Natural Gas: 22%
- Coal: 48%
- Nuclear: 19%
- Hydroelectric: 6%
- Other Renewables: 3%
- Other: 2%

2018:
- Natural Gas: 35%
- Coal: 27%
- Nuclear: 19%
- Hydroelectric: 7%
- Other Renewables: 11%
- Other: 1%
Figure 2.16 | Electricity generation for the four illustrative pathway archetypes plus the IEA’s Faster Transition Scenario (IEA, 2017d) (panel a), and the relative location in the ranges for pathways limiting warming to 1.5°C with no or limited overshoot (panel b). The category ‘Other renewables’ includes electricity generation not covered by the other categories, for example, hydro and geothermal. The number of pathways that have higher primary energy than the scale in the bottom panel are indicated by the numbers above the whiskers. Black horizontal dashed lines indicate the level of primary energy supply in 2015 (IEA, 2017e). Box plots in the lower panel show the minimum–maximum range (whiskers), interquartile range (box), and median (vertical thin black line). Symbols in the lower panel show the four pathway archetypes – S1 (white square), S2 (yellow square), S5 (black square), LED (white disc) – as well as the IEA’s Faster Transition Scenario (red disc). Pathways with no or limited overshoot included the Below 1.5°C and 1.5°C-low-OS classes.