

# Nuclear Power's Role in Meeting Demand Growth

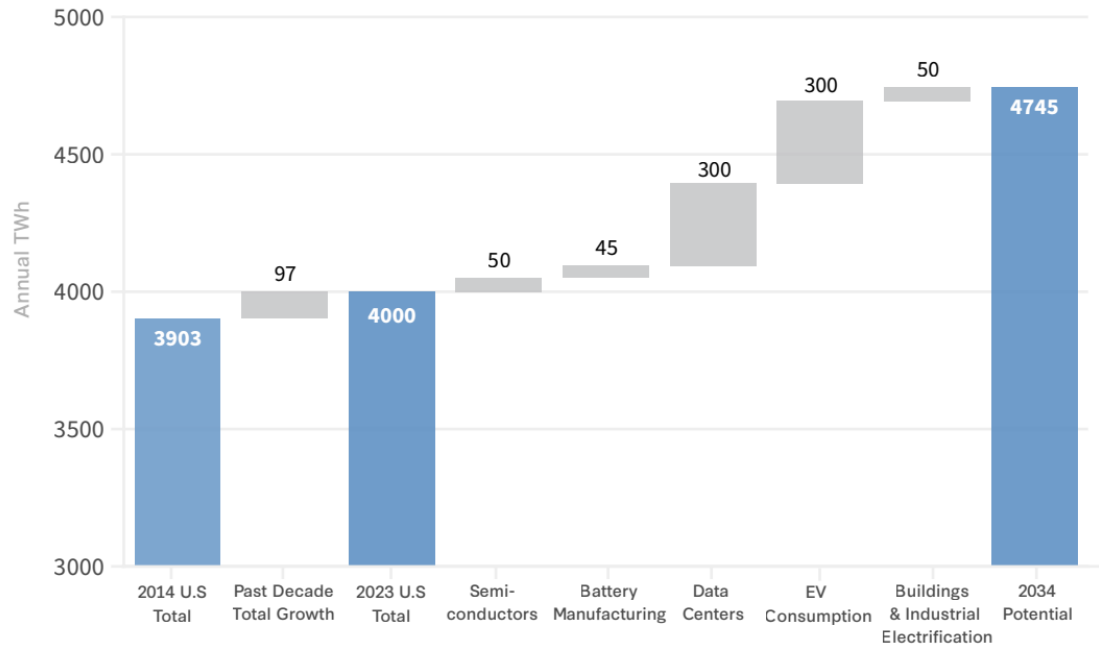
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November 1<sup>st</sup>, 2024

Cy McGeady, Fellow, CSIS

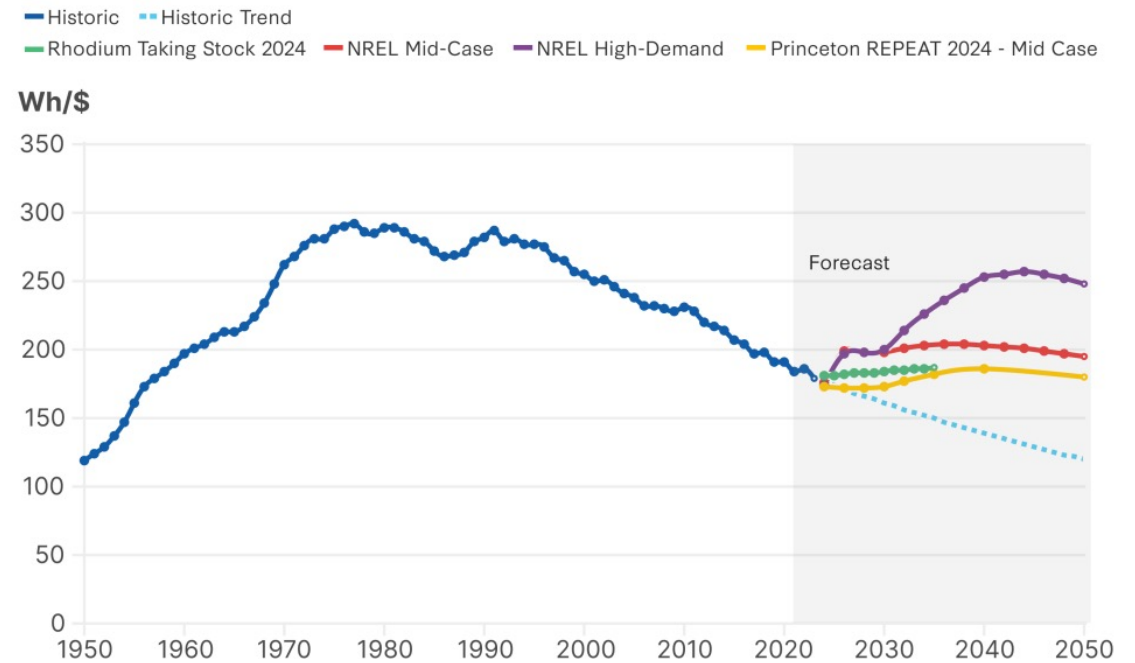
# Demand Growth Is Here

Figure 2: Key Sources of Electricity Demand Growth



Note: This should be interpreted as a non-exhaustive survey of sources of demand growth, not as a forecast.  
 Source: Author's estimates, "Annual Energy Review," U.S. Energy Information Administration (EIA), 2024, <https://www.eia.gov/totalenergy/data/annual/>.

Figure 3: Electricity Intensity of U.S. GDP



Source: "Annual Energy Review," EIA; "Explore Our Results," REPEAT Project, Princeton University, <https://repeatproject.org/results?comparison=benchmark&state=national&page=1&limit=25>; "Standard Scenarios," NREL, <https://www.nrel.gov/analysis/standard-scenarios.html>; and Ben King et al., *Taking Stock 2024: US Energy and Emissions Outlook* (New York: Rhodium Group, July 2024), <https://rhg.com/research/taking-stock-2024/>.

Source: CSIS "Powering The Commanding Heights"

# Headlines Versus Committed Capacity

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## Microsoft deal propels Three Mile Island restart, with key permits still needed

By Reuters

September 21, 2024 12:58 PM EDT · Updated a month ago

## Google to buy power for AI needs from small modular nuclear reactor company Kairos

By Timothy Gardner

October 14, 2024 3:46 PM EDT · Updated 18 days ago

## Amazon.com joins push for nuclear power to meet data center demand

By Timothy Gardner

October 16, 2024 10:12 AM EDT · Updated 16 days ago

**835 MW**, online ~2028 through 2054

**500 MW**, by ~2035

**320 MW**, by mid 2030s

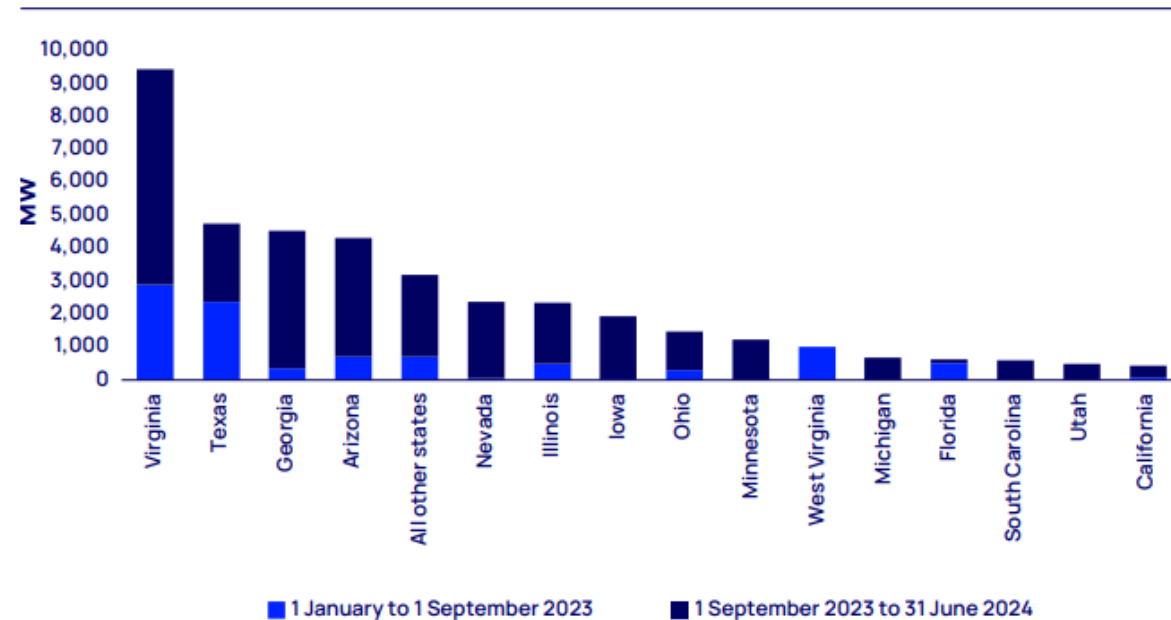
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**1.6 GW** in total by mid 2030s

# Committed Capacity Versus Datacenter Boom

“We have identified **51 GW of new data-centre capacity** announcements since January 2023, although this is probably only a sample of total project development”

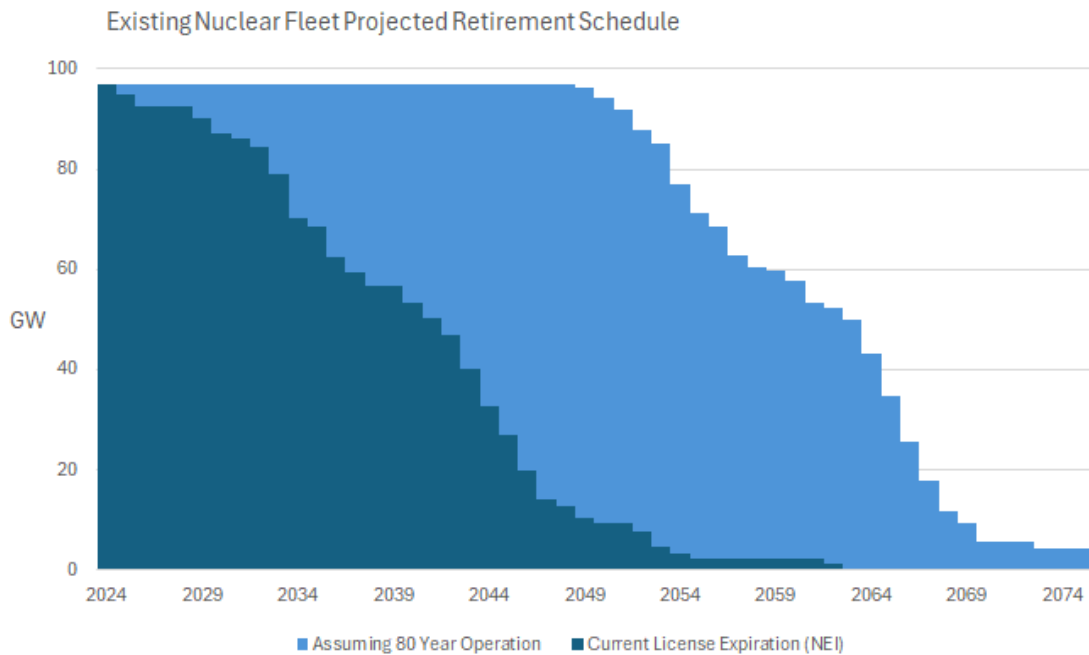
**Figure 2:**  
Announced data centres from 1 January 2023 through 31 June 2024 (MW)



Source: WoodMackenzie

# Nuclear's Share of the Mix

## An Ageing Nuclear Fleet



**2023**

**96 GW** of nuclear capacity (summer rating)  
**775 TWh** of generation (93% capacity factor)  
**19%** generation Share (~4100 TWh total)

## 2050 Scenario Matrix

Demand Growth (CAGR)	Total Capacity Required To Maintain Share	Implied New Build Capacity	
		Under Current License	Under 80 Year Operation
0.5%	108	99	14
1.0%	123	114	29
1.5%	140	131	46
2.0%	159	150	65

**Reminder: As of today 1.6 GW in total new capacity by mid 2030s**

# AP1000 vs SMRs

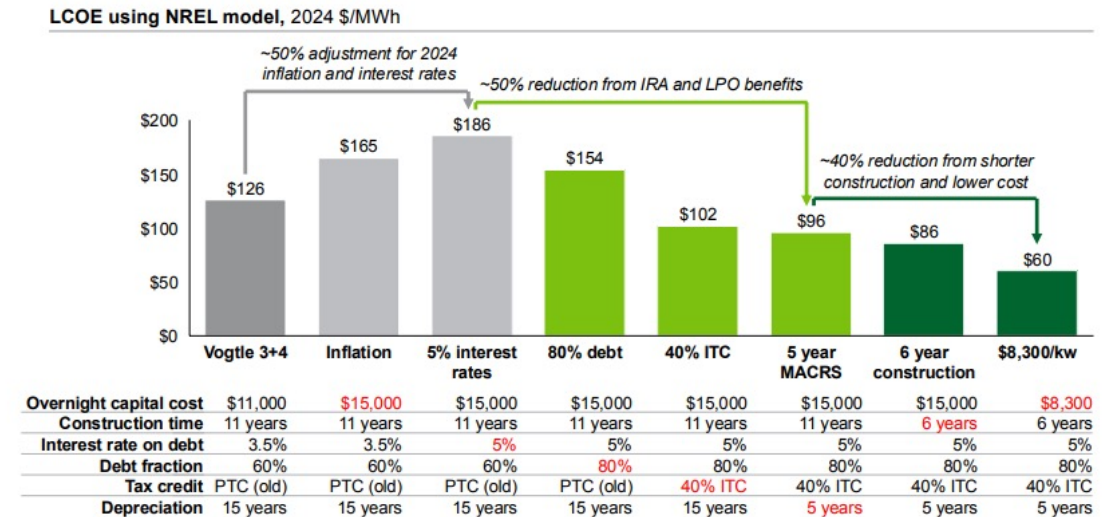
## Hyperscaler preference for small reactor designs

- A bet on replicability and iterative learning as pathway to cost declines and deployment scale
- A **long-term bet on colocation** based on negative long-term outlook for bulk power system prices, reliability, political risk, policy & regulatory dysfunction

## AP1000 economic case may appear attractive, but who takes the multi-billion-dollar risk?

- Ratepayers? Even Tim Echols of GA is skeptical w/o federal cost insurance
- Tech? Capital is better allocated to datacenter, direct AI investment
- Utilities or Merchants? AP1000 is too large a project to sit on a single balance sheet. JV or other joint development model is possible, but complicated to negotiate

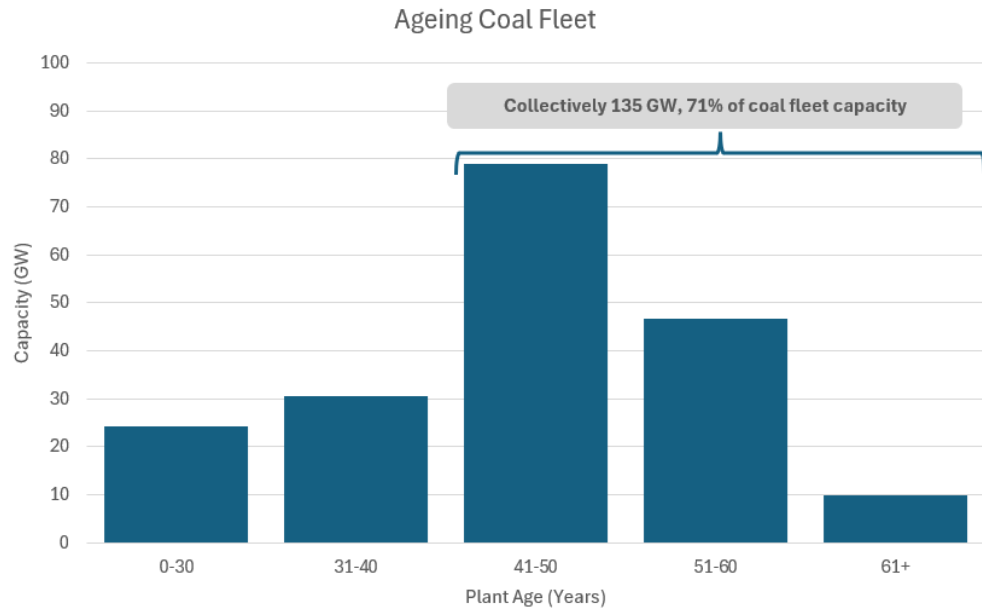
Figure 3: Even assuming Vogtle costs inflated to 2024, next AP1000 could be under \$100/MWh with IRA benefits, and closer to ~\$60/MWh with cost reductions



**\$8,300/kw still a ~\$9Bn project**

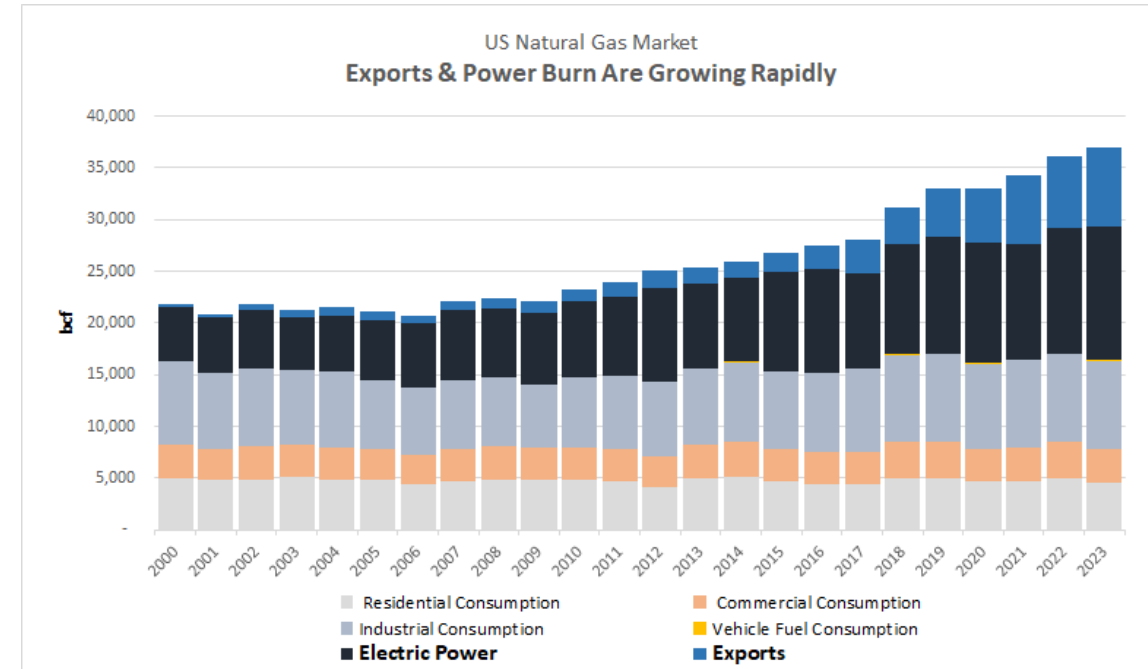
Source: DOE Updated Liftoff Report for Advanced Nuclear

# Coal & Gas



In **near term** coal retirements are being delayed & suspended  
 But, **long-term** direction of travel for coal fleet is clear is clear /  
 unchanging

**Coal retirements will continue to open large gaps in supply stack**  
 in 2030s and 2040s.



- Gas-fired power will be a major contributor over next 5-10 years.
- Combined growth from power burn & exports will test NG production and midstream

# Concluding Thoughts

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- **Nuclear has a very limited role to play in near to medium term**
  - No viable options for rapid deployment
  - Demand growth, ageing coal & nuclear fleet means a large-scale nuclear build-out in 2030s is crucial
  - Planning, Investment, and construction on initial reactors must start soon
- **As of now, little commercial interest in AP1000 -> Only way forward is through a fixed federal orderbook**
  - Price tag + Risk to large for single commercial entity to take on.
  - State regulators rightly weary of rate-based nuclear construction
- **Gas boom is manageable, but brings risks**
  - Ample upstream volumes. Near and medium-term risks lie with midstream capacity, investment, permitting.
  - Gas – Electric coordination risk, policy failures rapidly emerging as key priority
  - Long-term over-reliance / over-exposure on gas is a strategic mistake. Nuclear offers diversification, hedge value.