SCHLISSEL
TECHNICAL CONSULTING

Why New Reactors Are The Wrong Tools For Decarbonization

David Schlissel

April 22, 2026

My Background

- Degrees in Astronautical Engineering from the Massachusetts Institute of Technology (MIT) and Stanford University
- Law Degree from Stanford School of Law
- Studied nuclear engineering & project management courses in non-degree program at MIT
- Worked on energy, utility and environmental issues for over five decades
- Testified as an expert witness in state regulatory commissions in over 35 U.S. states, before the U.S. Nuclear Regulatory Commission (NRC) and the Federal Energy Regulatory Commission (FERC), and in state and federal court proceedings
- Filed expert testimony in over 130 state regulatory commission proceedings
- See my work at www.schlissel-technical.com and www.ieefa.org

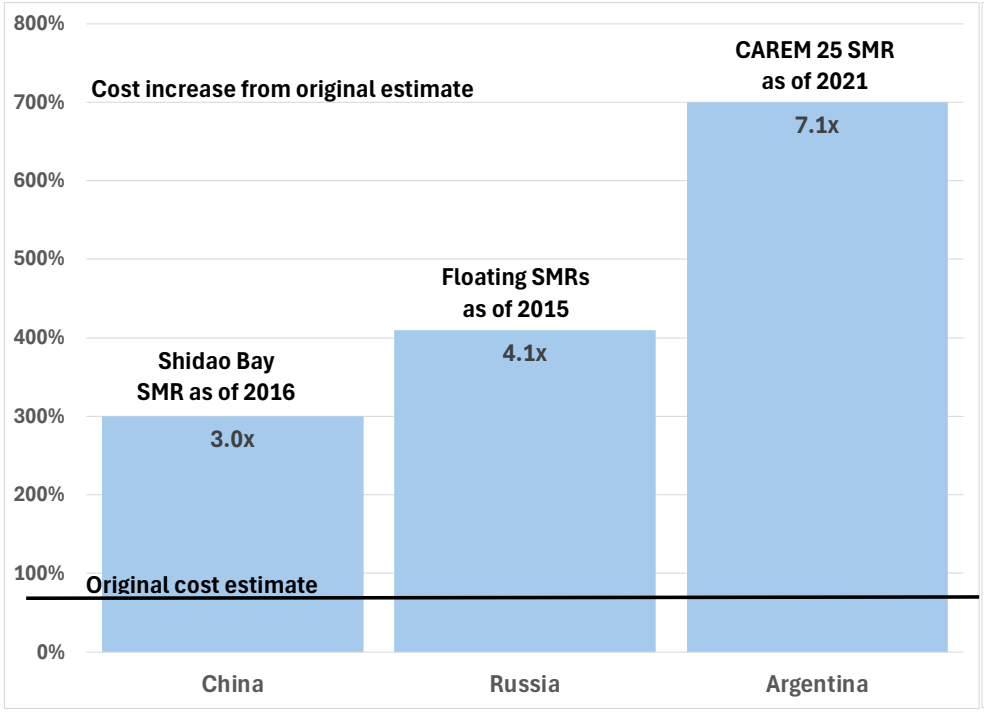
Some Important Definitions

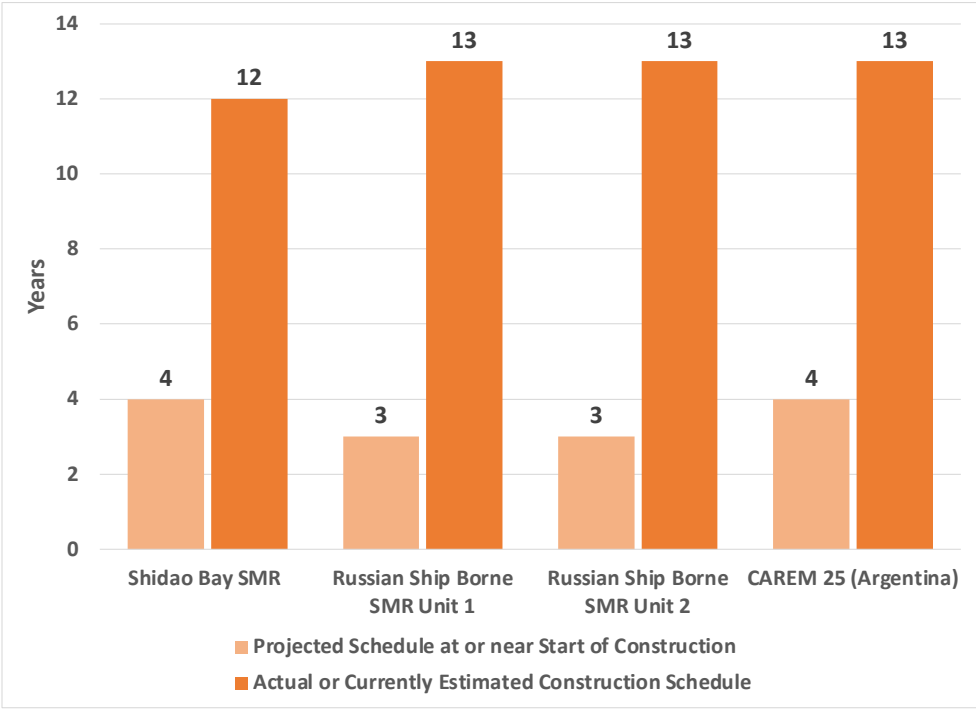
- Plant construction costs generally presented in dollars per kilowatt ($/kW)
- **Overnight cost estimate** – assumes hypothetically that new plant can be built overnight – excludes escalation and financing costs
- **All-in cost estimate** – includes escalation and financing costs
- A **Positive learning curve** – means when multiple copies of the same reactor design are built, the costs will go down as more are built
  - U.S. nuclear industry has never had a positive learning curve – has had a negative learning curve where costs have gone up
  - Even French nuclear program – 56 reactors with very similar designs – did not show a positive learning curve

What Are Large And Small Reactors?

- Size refers to the power of the reactor in electric megawatts (MW) - typically net of it's the power it uses for internal loads
- The only large reactors currently being marketed in the U.S. are Westinghouse AP1000 design, same as the two Vogtle reactors
- Despite the name, AP1000 reactors have a 1135 (net) power rating
- A small modular reactor (SMRs) is generally on the order of 350 MW or less
- But SMRs are also being marketed in packages – 2, 4 , whatever, so the total built at one site may be far higher than 350 MW
    - For example, NuScale SMR can have 12 modules at 77 MW each = total 924 MW project

SMRs Built in Other Countries Have Experienced Significant Cost and Schedule Overruns



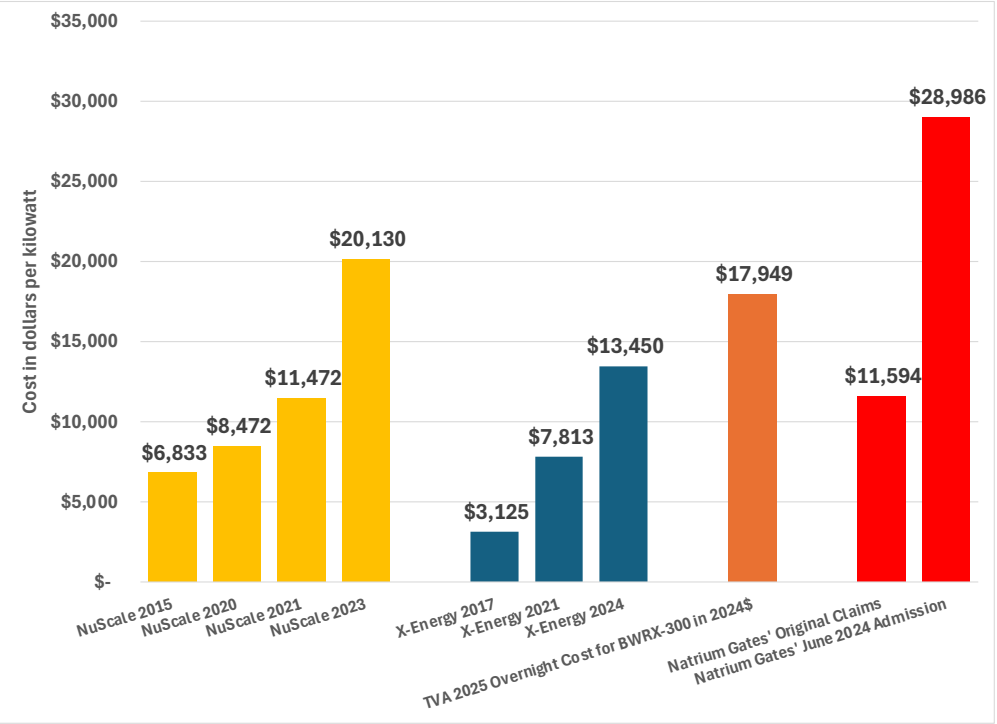


Estimated Costs for SMRs Currently Being Marketed in U.S. Have Already Gone Up Dramatically

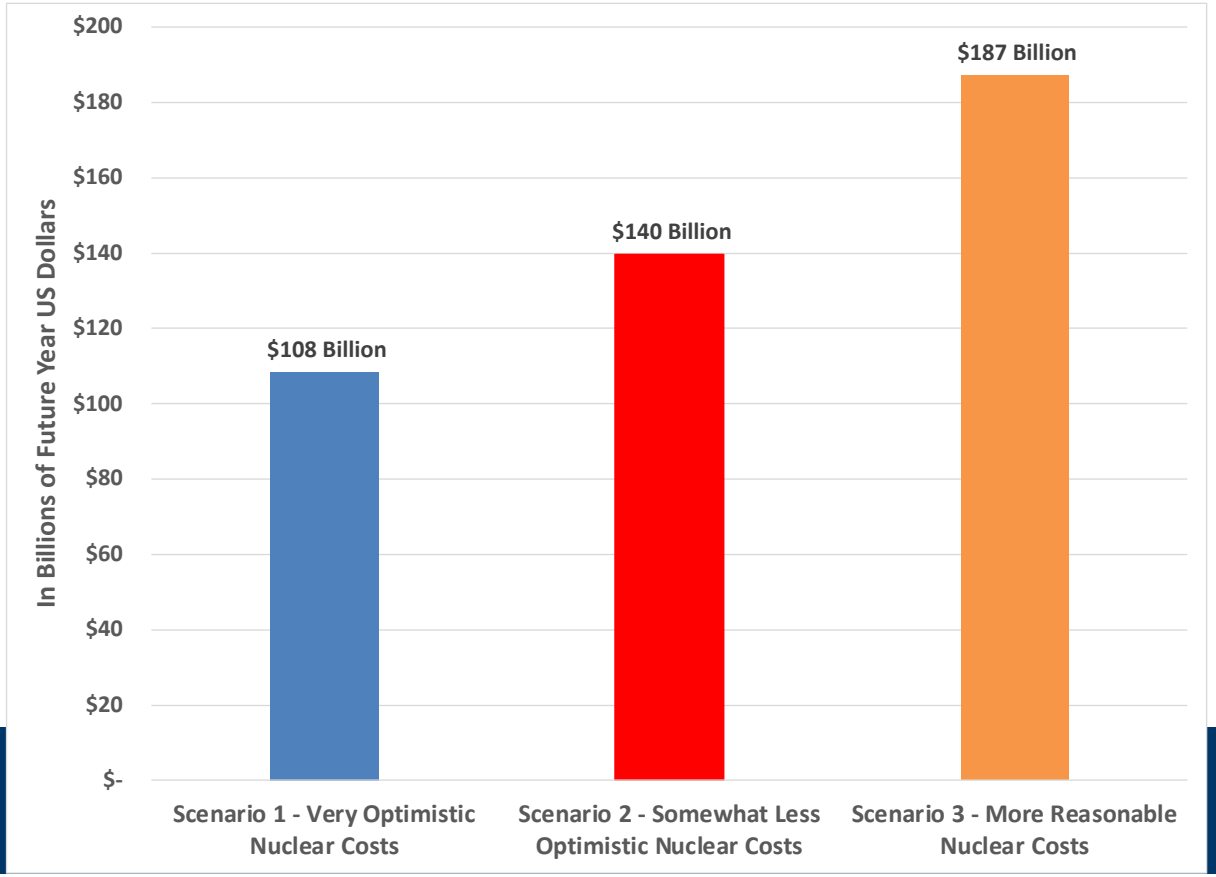
Estimated cost of NuScale's proposed UAMPS SMR, on a dollar per kW basis, increased by **138%** between 2020 and 2023.

Estimated cost of X-Energy SMR increased by **72%** between 2021 and 2024.

Costs of building SMRs should be expected to continue to go up significantly in the years before any will be online.



The Cost of Building Five New Large AP1000 Reactors In New York State By 2040 Could Reach As High As $187 Billion



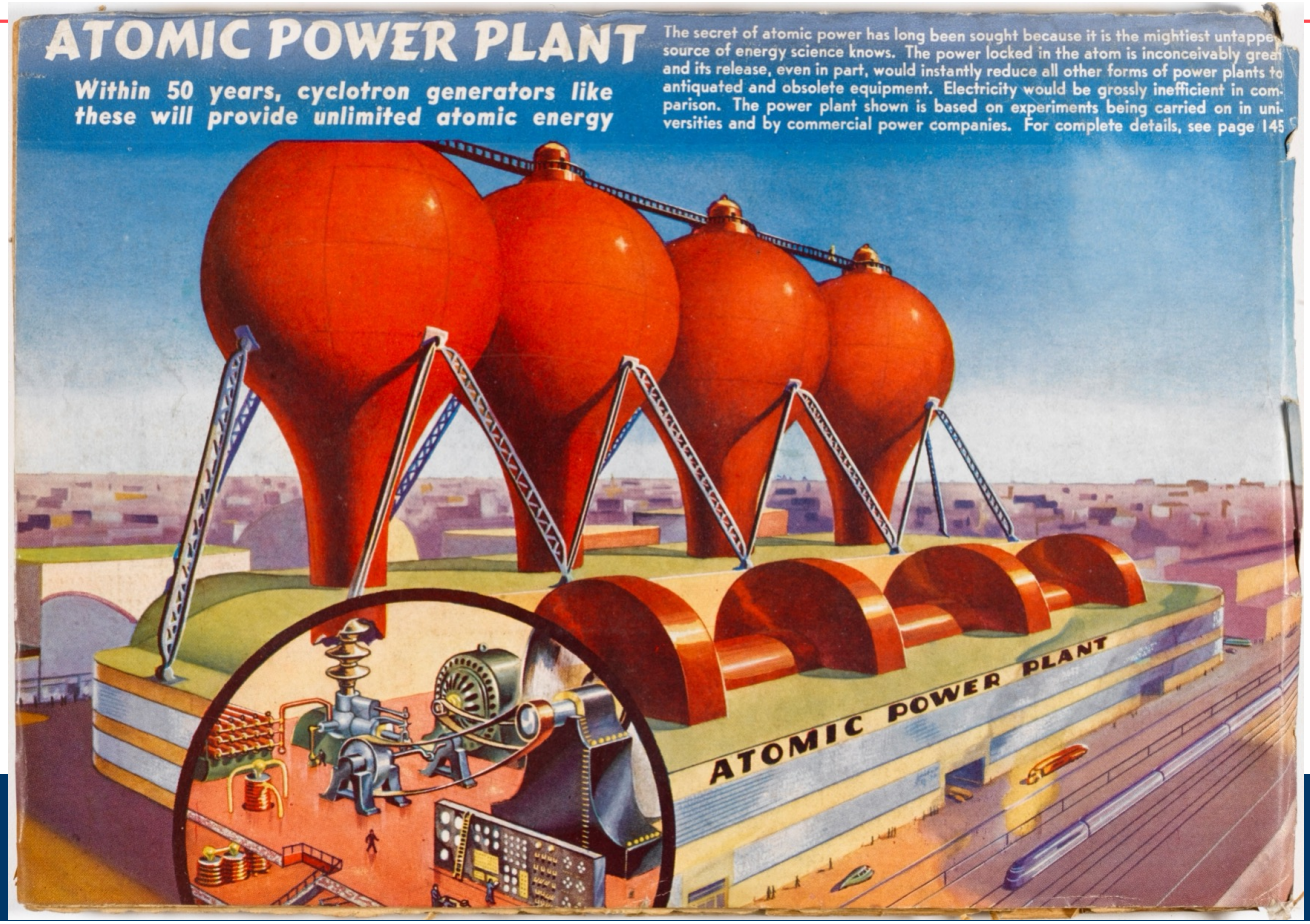
SCHLISSEL TECHNICAL CONSULTING

Announced Schedules for Three SMR Designs Being Marketed in the US Have Already Slipped by Years

- NuScale originally claimed that its first SMR project would be producing electricity by 2015-2016
  - The reactor's start of commercial operations was subsequently delayed twice – first to 2026-2027 and then to 2029-2030
  - The project was subsequently cancelled in 2023 after its estimated cost increased by 59%
- Similarly, the Xe-100 reactor project planned for Washington State was initially scheduled to be completed in 2027-2028 but is now not expected to be in operation until September 2033
- Bill Gates initially said the Natrium reactor would begin generating power in 2028 but they have delayed its schedule until 2030 - of course, blaming someone else for the delay

A Very Short History of Nuclear Power in the U.S.

Initial Claim In 1950s – Atomic Power "Would Be Too Cheap To Meter"



Source of Quote: U.S. Atomic Energy Commission Chairman Lewis Strauss

But Soon New Reactors Became Too Expensive to Build

Estimated vs Actual Overnight Cost of 75 Reactors that Started Construction in 1966-77 (1982 dollars)

Estimated Construction Schedule at Start of Construction vs Actual

Results of 1986 DOE study understated cost and schedule overruns: (1) overnight costs don't include financing costs or inflation & (2) many of most expensive reactors were not included

New Reactors Became Unaffordable For Ratepayers

- Ratepayers experienced “rate shock” when high costs of new reactors put into rates
- Almost 50% of all proposed reactors were cancelled – many due to soaring costs and/or projected increases in demands for electricity that did not materialize
- Many ratepayers had to pay for some of the costs of some of the cancelled projects – e.g., Shoreham reactor closed in 1989 but Long Island ratepayers are still paying

What Was The Nuclear Industry's Response After The First Wave of Reactors Was So Expensive?

The Industry claimed

New reactor designs would benefit from modular construction in terms of both shorter construction time and lower costs

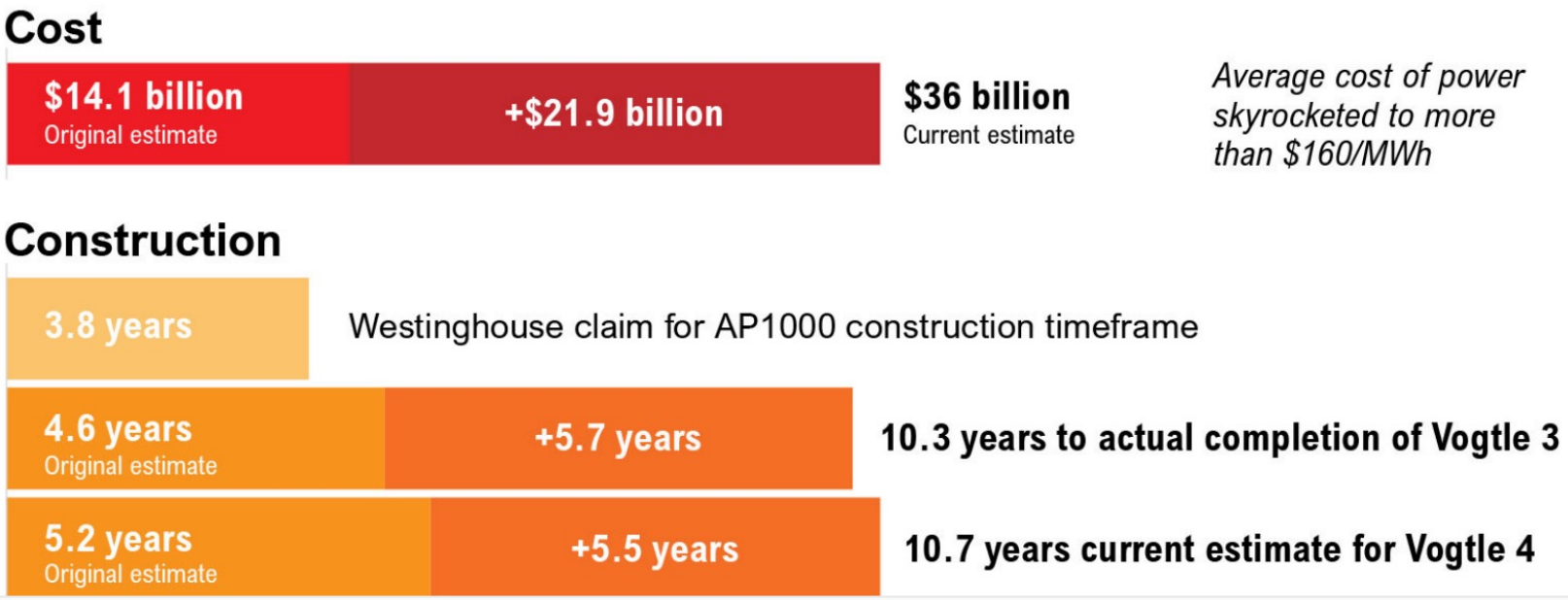
Westinghouse's promotional materials for its new AP1000 reactor design even claimed the construction for its new reactors would only take three years from placement of nuclear concrete to fuel load

Did This Lead To Less Expensive Reactors?

- **No**

- South Carolina ratepayers are still paying for the two cancelled reactors in that state
- The Vogtle Nuclear Project in Georgia ended up costing 2.5 times what was claimed before start of construction and took five+ years longer to build

The Vogtle Cost And Schedule Disaster



The Vogtle Disaster Has Meant Much Higher Electric Bills For Georgia Ratepayers

- Residential ratepayers of Georgia Power Company were made to pay for Vogtle reactors for at least 10 years before the reactors were providing any power to them because some of the spending on the project was put into the company's rates as 'construction work in progress' (CWIP)
- Then, after the plant was completed, the State Public Service Commission granted the power company another 25% rate increase, perhaps for as long as 60 years, to pay for Georgia Power's 45.7% of the cost of the Vogtle reactors

What Do The Industry And Its Supporters Say After Vogtle?

1. Make the same claim that Westinghouse made before Vogtle, ‘new reactors (large and small) will be built faster and at lower cost than existing reactors because they will use modular construction and build multiple copies of the same designs’
2. Ignore the new economic environment in which new reactors would be built
3. Falsely claim that federal and state nuclear subsidies make building new reactors less expensive for electric ratepayers and taxpayers
4. Also falsely claim that large reactors are needed to serve rising loads due to data centers and AI and that renewables won’t be enough

What's Wrong With Nuclear Supporters' Claims That Future Reactors Will Be Built Faster and at Lower Cost?

What's Wrong With Nuclear Supporters' Claims That Future Reactors Will Be Built Faster and at Lower Cost?

1. Their claims on cost and schedule are based on a series of assumptions, not any actual supporting evidence
2. They bias the results of economic and financial analyses with these false claims and unsupported assumptions

How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

1. Claim or Assumption – There will not be any cost or schedule overruns in the building of new reactors

   Fact – the nuclear industry has experienced massive cost overruns and years-long schedule overruns in building reactors since 1970. There is no evidence suggesting that similar overruns will not be experienced in the future

How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

2. Claim or Assumption – Do not discuss or model any uncertainty around either how much new reactors will cost or how long it will take to build them

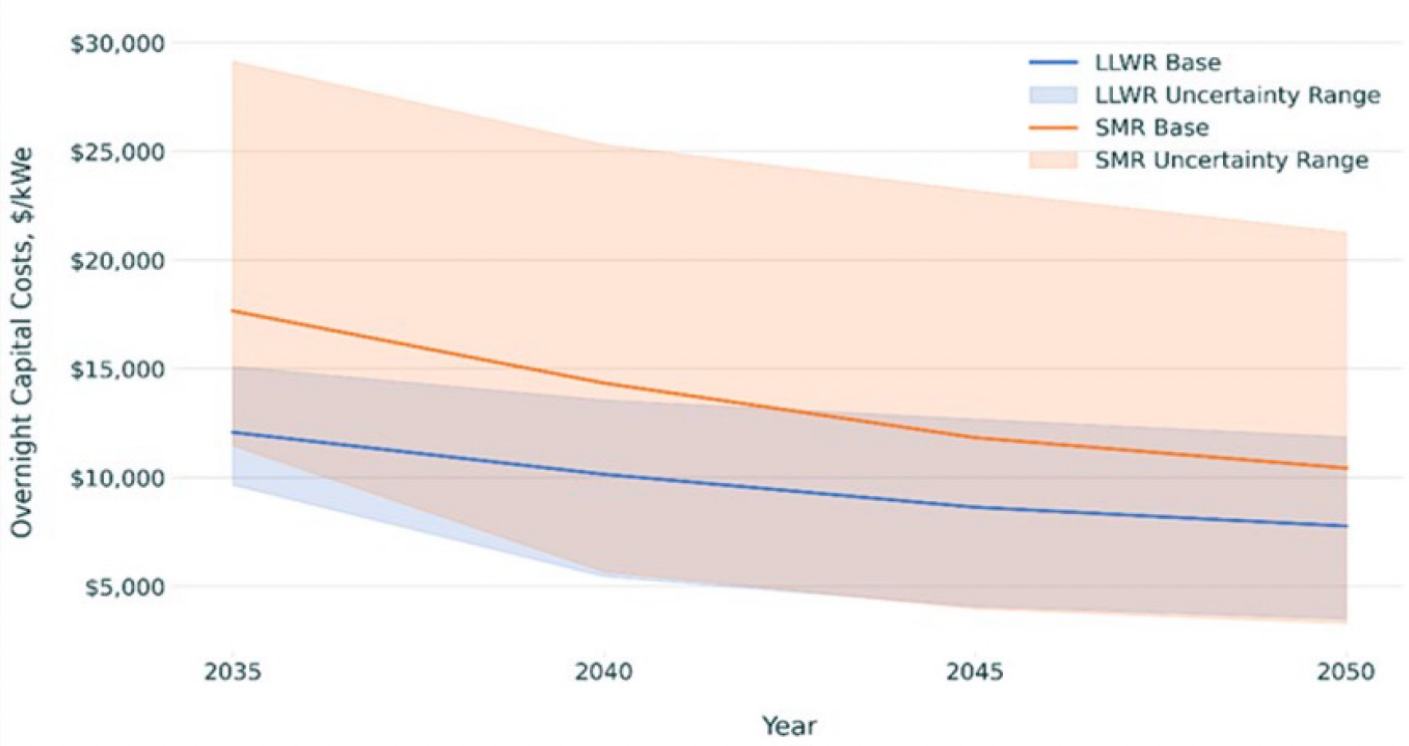
   Fact – There is great uncertainty in future reactor costs and how long it will take to construct them – which even some nuclear proponents acknowledge but even then they do not model this uncertainty in their analyses

There Is Uncertainty As to What Future Reactors Actually Will Cost – But The Industry Pretends It's Not There

And Even When They Acknowledge This Uncertainty They Don't Model It In Analyses

In this chart EPRI notes the wide range of uncertainty for what new SMRs and large light water reactors could cost to build but suggests there is only a single cost trajectory for each type of reactor

Source: EPRI *Zero by 2040 Technoeconomic Assessment*



SCHLISSEL TECHNICAL CONSULTING

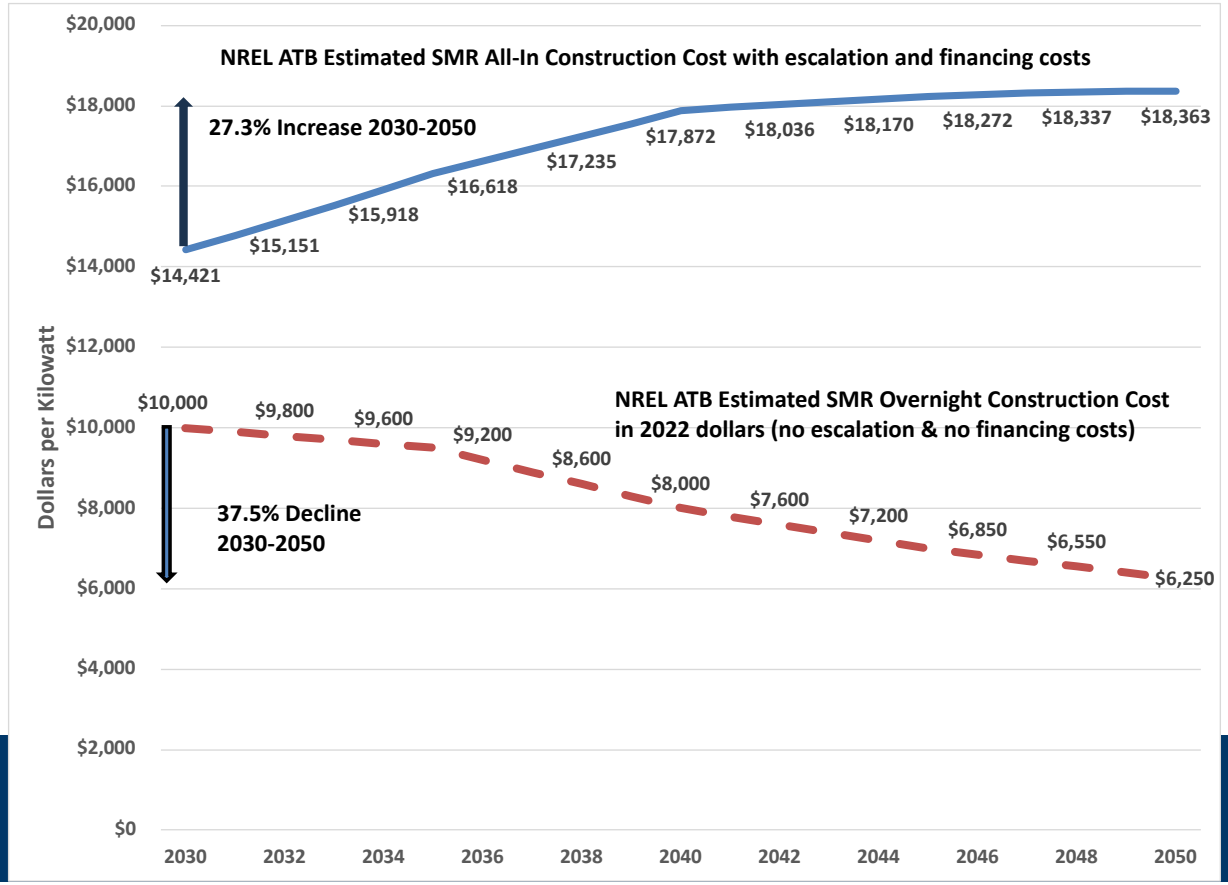
How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

3. Claim or Assumption – There will be a positive learning curve in building new reactors which means that their **overnight** costs will decline as more reactors with the same design are built and the time it takes to build them also will go down

   Fact – Such a positive learning curve has never been achieved in the US in either the costs of building new reactors or the time taken to build them

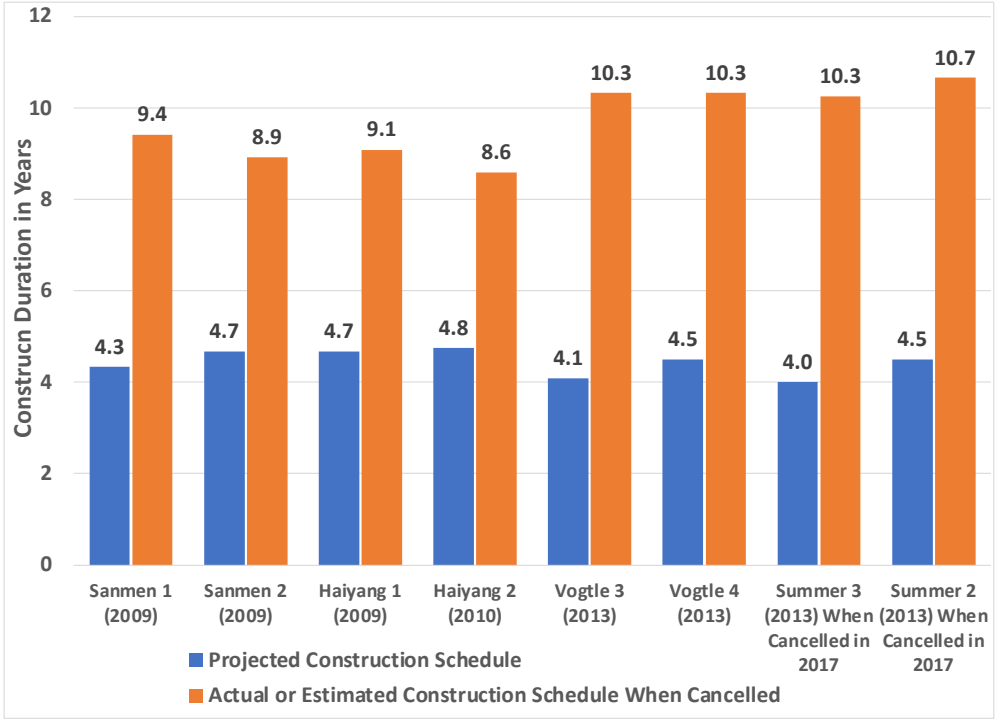
   Even French nuclear program which built 56 reactors with very similar designs experienced increasing costs for new reactors

The Only Way To Show A Positive Learning Curve Is By Ignoring Costs (Use Overnight Instead of All-In Costs)



SCHLISSEL TECHNICAL CONSULTING

There is No Evidence that Nuclear Has Achieved a Positive Learning Curve – Example AP1000 Construction Times



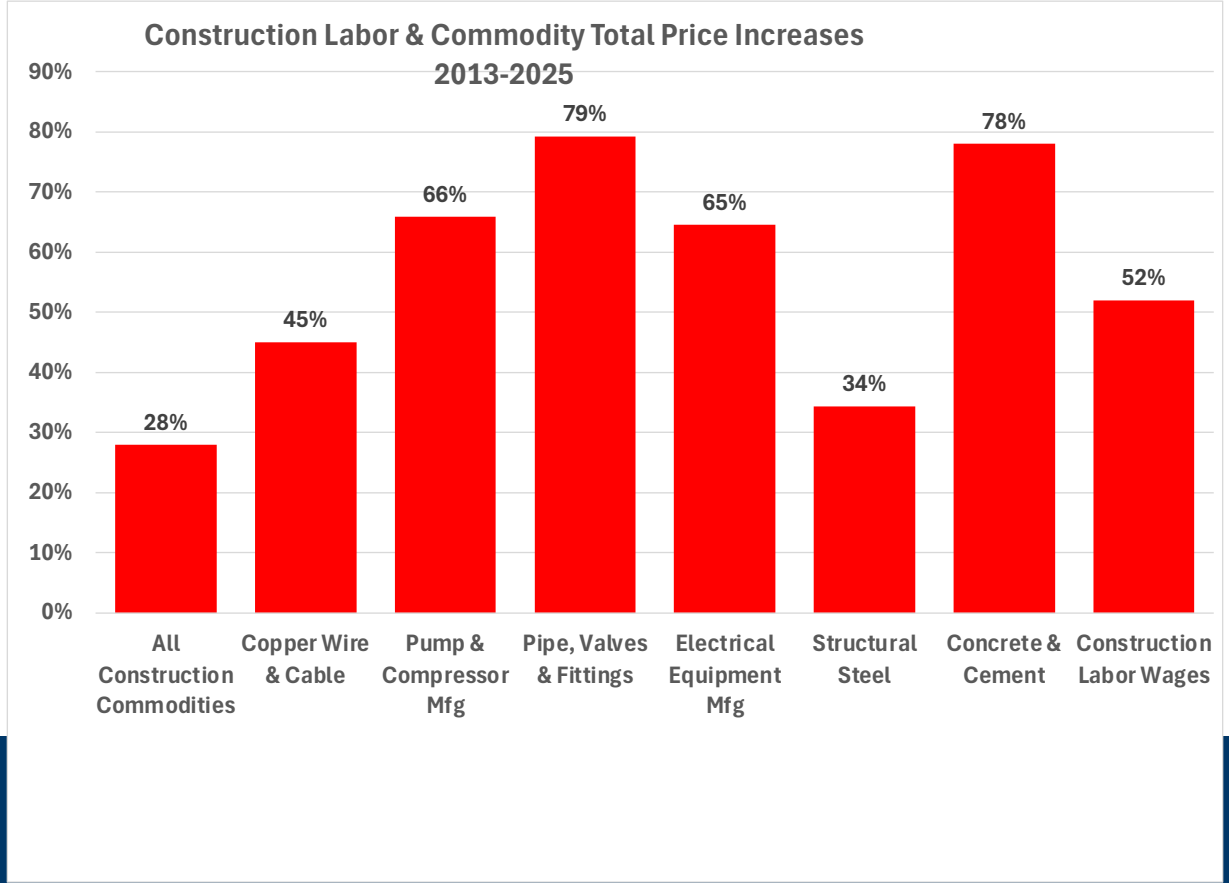
How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

4. Claim or Assumption – The All-in costs of new reactors in the future will escalate at only a very low annual rate – e.g., 2% or current CPU forecast of ~ 2.5% annual growth over next 10 yrs

   Fact – U.S. nuclear costs have historically increased at an annual 4% rate and have exceeded 6% in recent years

   Even a pro-nuclear study from Idaho National Laboratory has noted that the use of the CPI in analyses could be biased because it does not represent capital goods or inputs specifically for nuclear energy

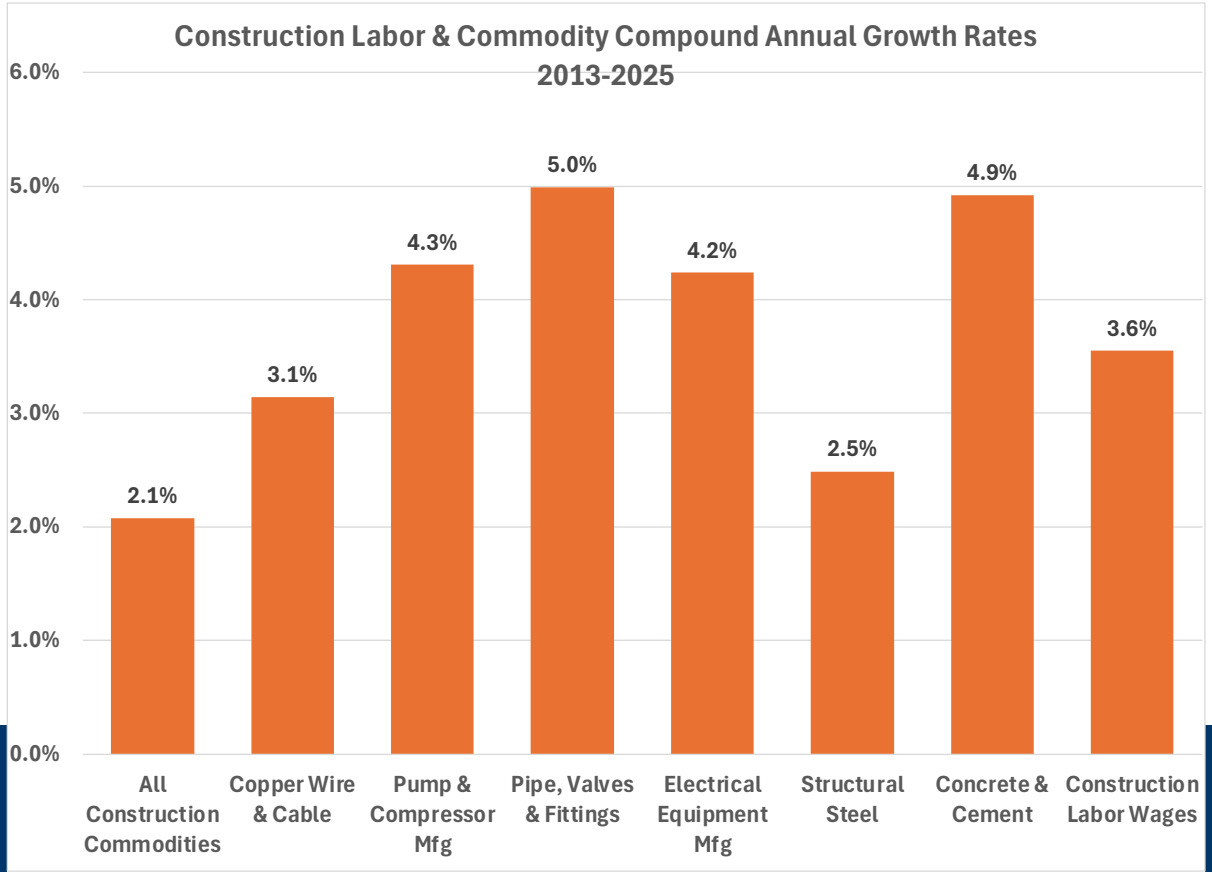
The Future Economic Environment In Which New Reactors Would Be Built Will Be Much More Expensive



Source: Federal Reserve Bank of St. Louis FRED database

SCHLISSEL TECHNICAL CONSULTING

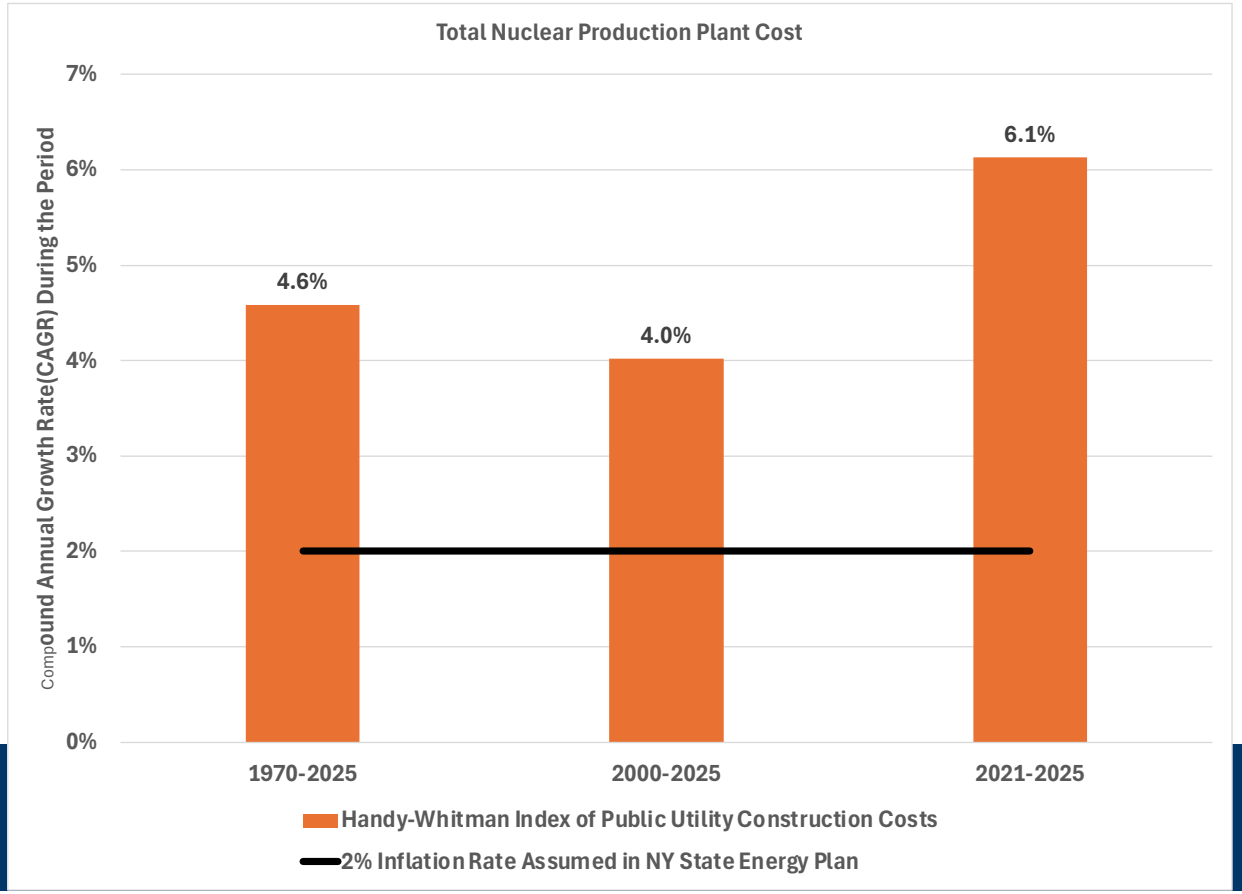
The Future Economic Environment In Which New Reactors Would Be Built Will Be Much More Expensive



Source: Federal Reserve Bank of St. Louis FRED database

SCHLISSEL TECHNICAL CONSULTING

But Pro-Nuclear Studies Assume Future Costs Will Increase At Just 2% or 2.4% Per Year Instead of Past 4% - 6% Annual Rate



SCHLISSEL TECHNICAL CONSULTING

How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

5. Claim or Assumption – They implicitly assume that there is currently a supply infrastructure for building new reactors in place or that one will be available in the very near future

   Fact – As the U.S. Department of Energy and even some pro-nuclear reports have acknowledged, there is no robust nuclear supply infrastructure in place in the US at this time and it is unclear how soon one can be created

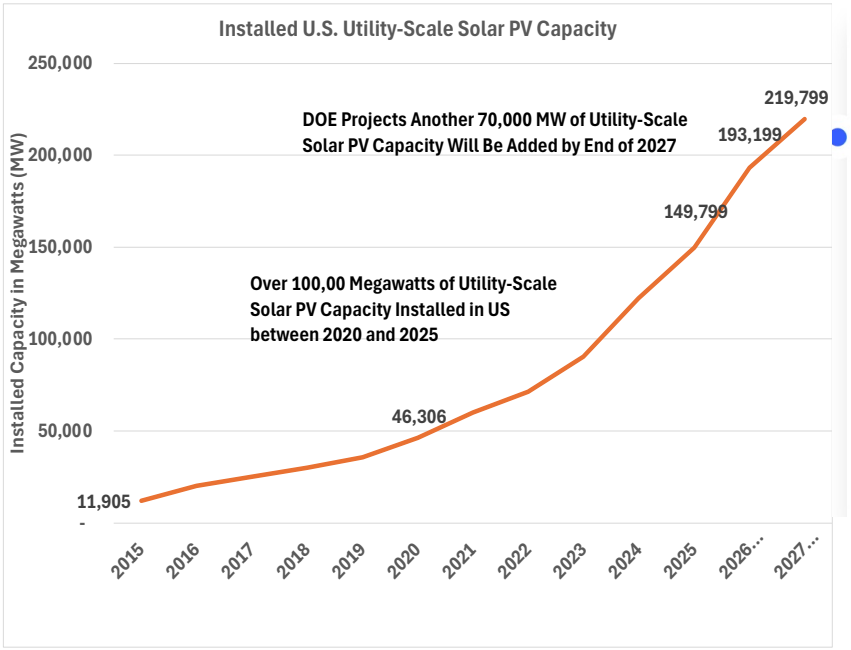
How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

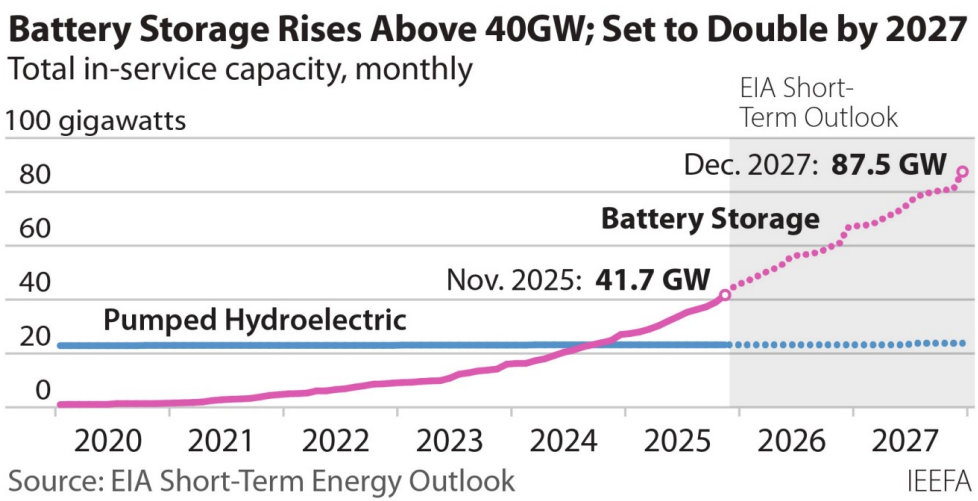
6. Claim or Assumption – Nuclear reactors are needed because we can't meet decarbonization goals by relying on just renewable resources and/or we need the new reactors to serve projected new demands due in large part to data centers and AI

   Fact – This is untrue. Renewable technologies are here today and can meet future electricity demands sooner and at lower cost than building more nuclear reactors

   Also big mistake to rely on new reactors that won't be ready for more than a decade to meet projected near-term demands

Solar & Battery Storage Technologies Exist Today And Their Use In The U.S. Is Skyrocketing





Choosing Reactors That Will Take A Decade or More To Build To Serve Uncertain Future Electric Loads Is A Very Bad Idea

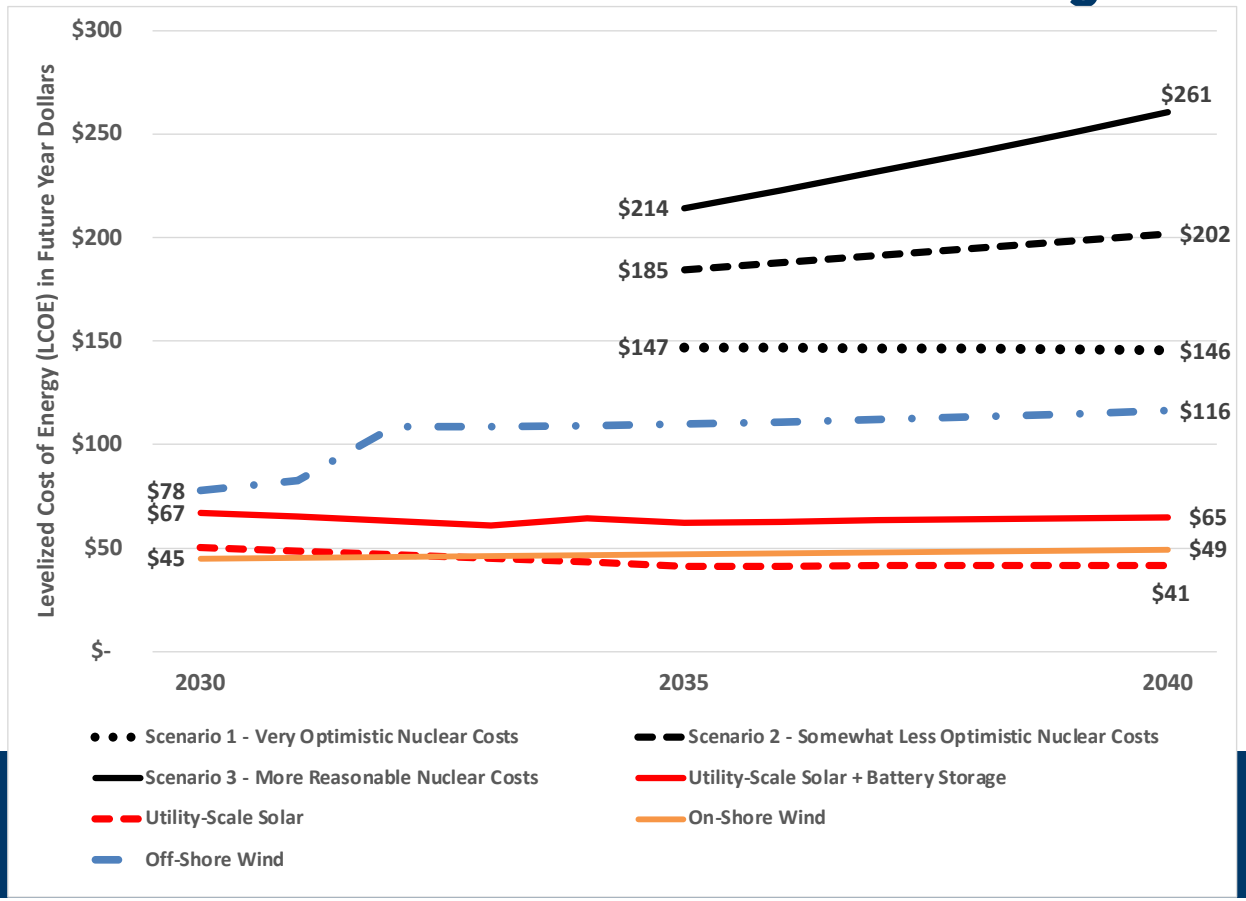
- Renewable resources & battery storage are flexible options that can be added significantly sooner than new reactors
- This means more renewables & storage capacity can be added quickly if projected loads materialize sooner than expected
- Or planned resource additions can be delayed or cancelled if projected demands don't materialize
- But the same flexibility does not exist with new reactors - if new demands don't materialize, ratepayers could be made to pay for cancelled projects or stranded reactor costs

How Nuclear Proponents Bias Analyses In Favor of Building New Reactors

6. Claim or Assumption – Nuclear reactors are less expensive that renewable resources such as solar, battery store, wind (offshore and onshore)

   Fact – This is untrue. See next slides

The Electricity From New Reactors Will Be Much More Expensive Than From Renewables and Storage



SCHLISSEL TECHNICAL CONSULTING

The Electricity from New Reactors Will Be Much More Expensive Than From Renewables and Storage

All costs are in Dollars per Megawatt-Hour ($/MWh)

Resource/Scenario	2030 LCOE	2035 LCOE	2040 LCOE
Scenario 1 – Very Optimistic Nuclear Costs	NA	$147	$146
Scenario 2 – Less Optimistic Nuclear Costs	NA	$185	$202
Scenario 3 – More Reasonable Nuclear Costs	NA	$214	$261
Utility-Scale Solar PV and Battery Storage	$67	$62	$65
Solar PV	$41	$41	$41
On-Shore Wind	$45	$47	$49
Off-Shore Wind	$78	$110	$116

Sources - Analysis by David Schlissel using data, assumptions and spreadsheet from NREL's 2024 Annual Technology Baseline, *New York 2025 State Energy Plan*, *EPRI/NYSERDA ZERO By 2040 Technoeconomic Assessment*, DOE's September 2024 *Pathway to Commercial Liftoff: Advanced Nuclear*, and the *Handy-Whitman Index of Public Utility Construction Costs*

For More Information

Contact

david@schlissel-technical.com

See

Small Modular Reactors, Carbon Capture: The Wrong Resources for Colorado's Energy Transition (co-authored with Dennis Wamsted, IEEFA)

Nuclear Hype Ignores High Cost, Long Timelines – Nuclear Options Are Years Away, While Solar, Storage and Geothermal Are Clean, Cost-Effective Options Ready Now (co-authored with Dennis Wamsted, IEEFA)

More reports, presentations and expert testimony on nuclear financial costs and risks are available at Schlissel-technical.com