



**Institute for Energy Economics
and Financial Analysis**

Nuclear Water Woes

Hotter, drier world poses growing threats
to new and existing nuclear power plants

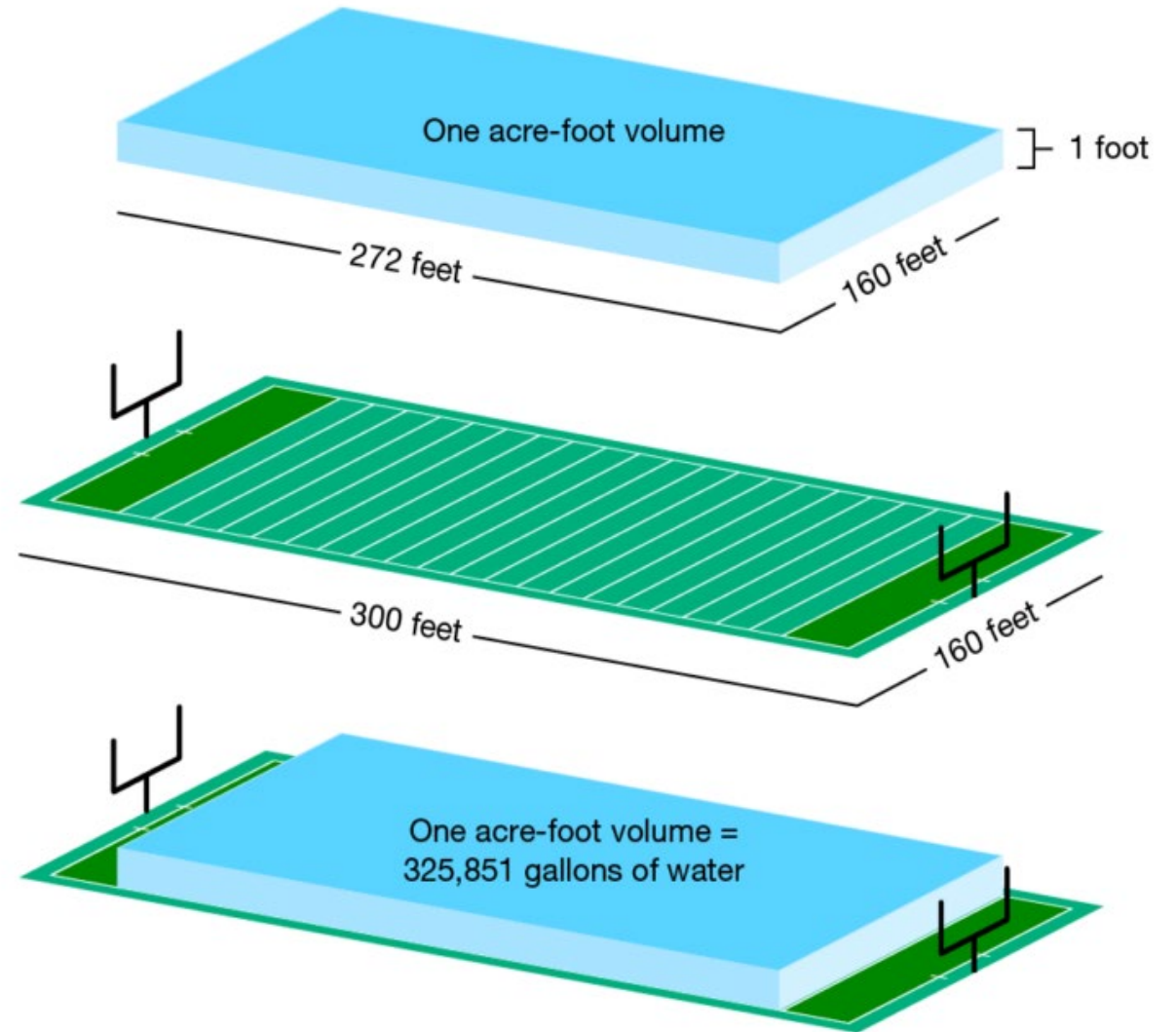
Dennis Wamsted, IEEFA Energy Analyst

September 17, 2026

Water Demand and Nuclear Power

How much water?

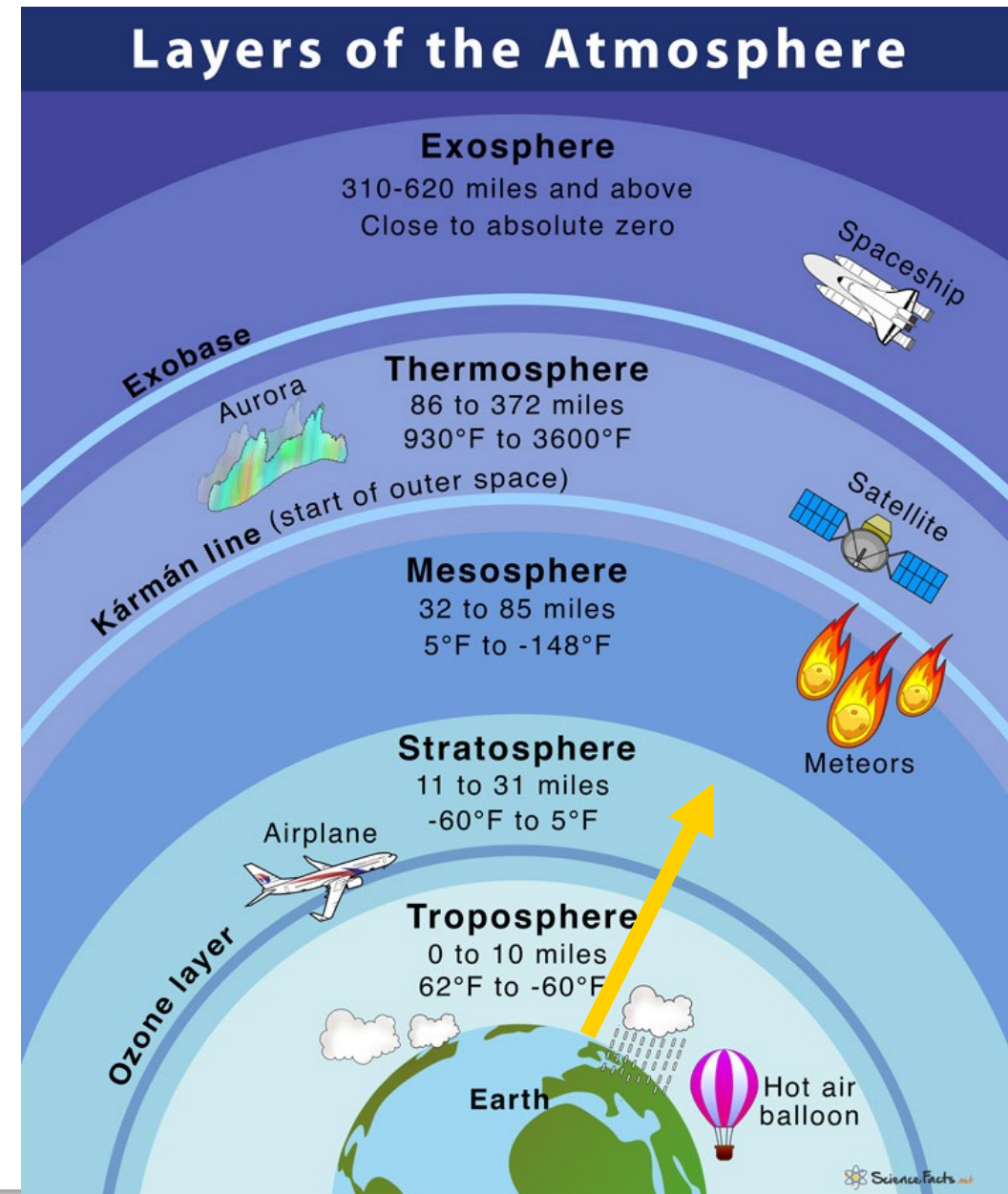
- Southern's AP1000 units at Vogtle 3&4 are permitted to use 69,449 acre-feet of water annually
- That would cover a football field with a column of water more than 13 miles high



Source: North Marin Water District

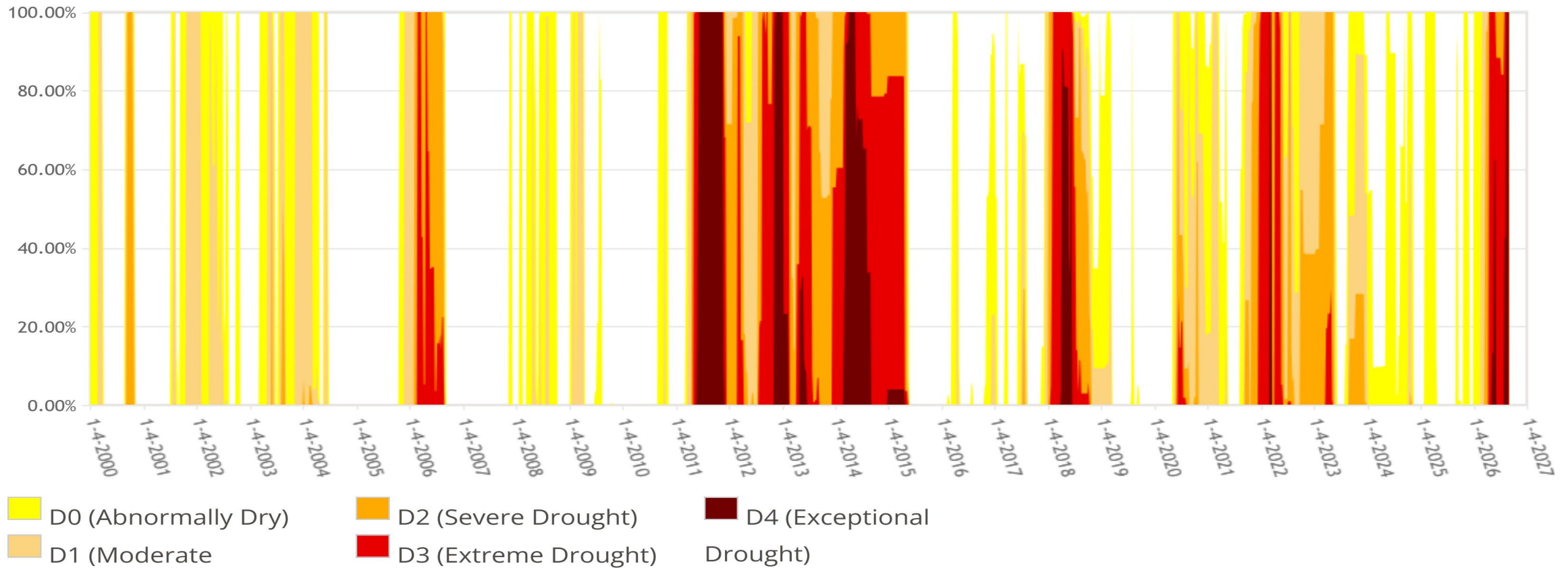
How much water?

- Fermi is planning 4 AP1000 units at its Matador project – potentially requiring ~140,000 acre feet of water annually
- That would push the column of water 26 miles into space – well up into the stratosphere



How Much Water?

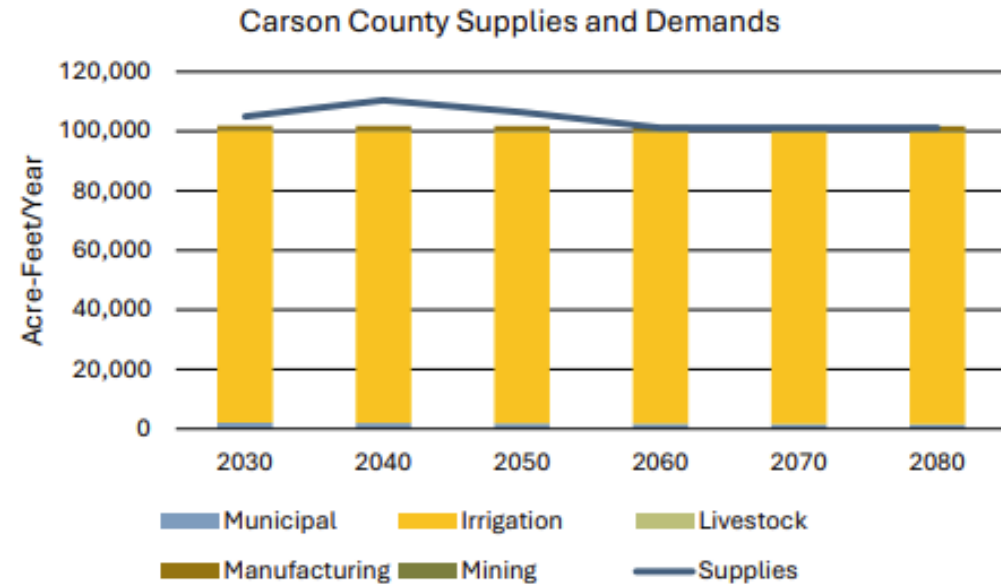
Carson County (TX) Percent Area in U.S. Drought Monitor Categories



Drought)

How much water?

- Carson County, where Fermi is located, shows a rough balance in its water supply and demand needs through 2080
- But the plan does not account for Fermi's prospective demand – which would dwarf the county's current supply



Source: 2026 Panhandle Water Plan

Fermi's 'Solution'

Fermi's Cooling Plans

- Its initial NRC filing was direct –

““ The operational phase of the AP1000 units at Fermi America will not rely on wet cooling towers. Instead, air-cooled condenser (ACC) systems significantly reduce consumptive water use, limiting demand to system makeup, domestic supply, and incidental process needs.”

Fermi's Cooling Plans

- However, ACC systems are not a great solution for nuclear plants
 - A study Southern conducted during the Vogtle licensing process was straightforward: “The current reality is that an air-cooled system is not technically feasible for an AP1000 unit constructed at the Vogtle site.”
 - That reality essentially boils down to one key point -- evaporative cooling is more efficient

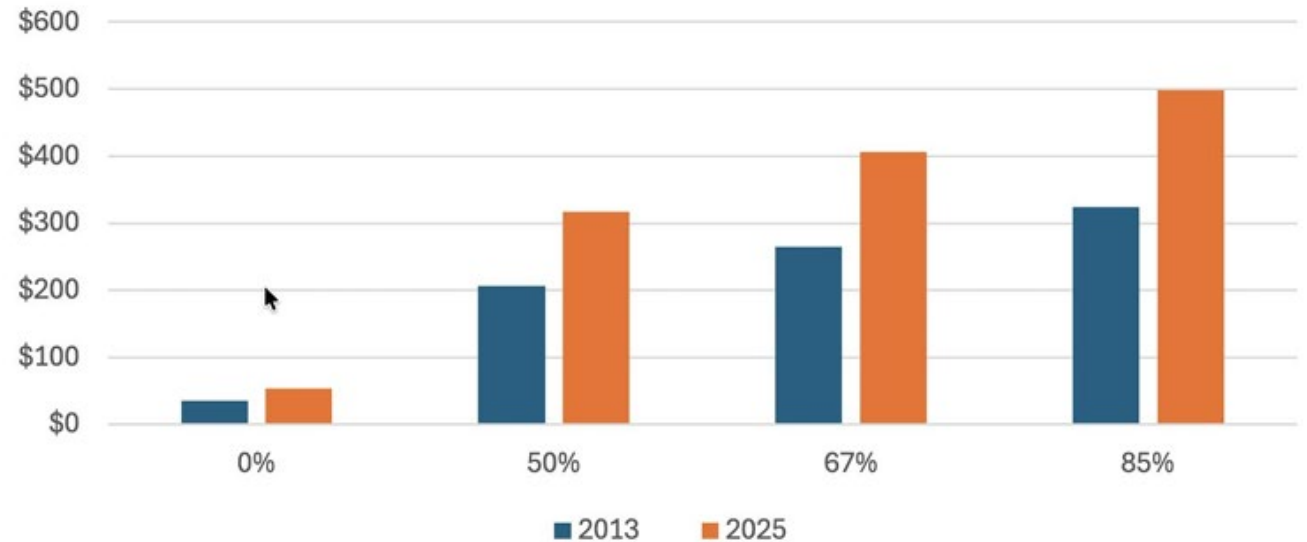
Fermi's Cooling Plans

- The third option, apparently now the company's choice, is a hybrid approach combining evaporative and air-cooled units into one system
- Hybrid systems have been used on large coal-fired units in Australia and South Africa, but they have never been used at a nuclear power plant

Fermi's Cooling Plans

- Hybrid cooling systems are expensive – very expensive
- EPRI study highlights the additional cost associated with hybrid systems
 - The more water saved, the higher the cost
 - Fermi's location means aiming for the greatest water savings could be required, with obvious economic implications

Escalated Capital Cost of Cooling Systems
(in millions of dollars by percentage of water saved)



Source: IEEFA calculations, EPRI data.

Fermi's Cooling Plans – A Caveat

- Hybrid cooling systems have never been approved by NRC
 - Company – and nuclear proponents in general – stress the need for design standardization and moving rapidly
 - Having to seek NRC approval for its unique cooling system is the opposite of standardization – but it will be necessary

““ The potential for air or hybrid cooling is not considered in the current design. Any applicant wishing to utilize alternate cooling would have to come to NRC for approval.” – NRC statement to IEEFA

A Wider Look at Nuclear's Water Woes

A Difficult Summer on the Danube



Europe's Nuclear Drought

■ Paks

- 1916 MW / 4 units
- Russian VVER PWRs
- Online in 1982, 1984, 1986 & 1987

■ Cernavoda

- 1300 MW / 2 units
- Canadian CANDU PHWRs
- Online in 1996 and 2007

■ Kozloduy

- 2006 MW / 2 units
- Russian VVER PWRs
- Online in 1987 and 1991

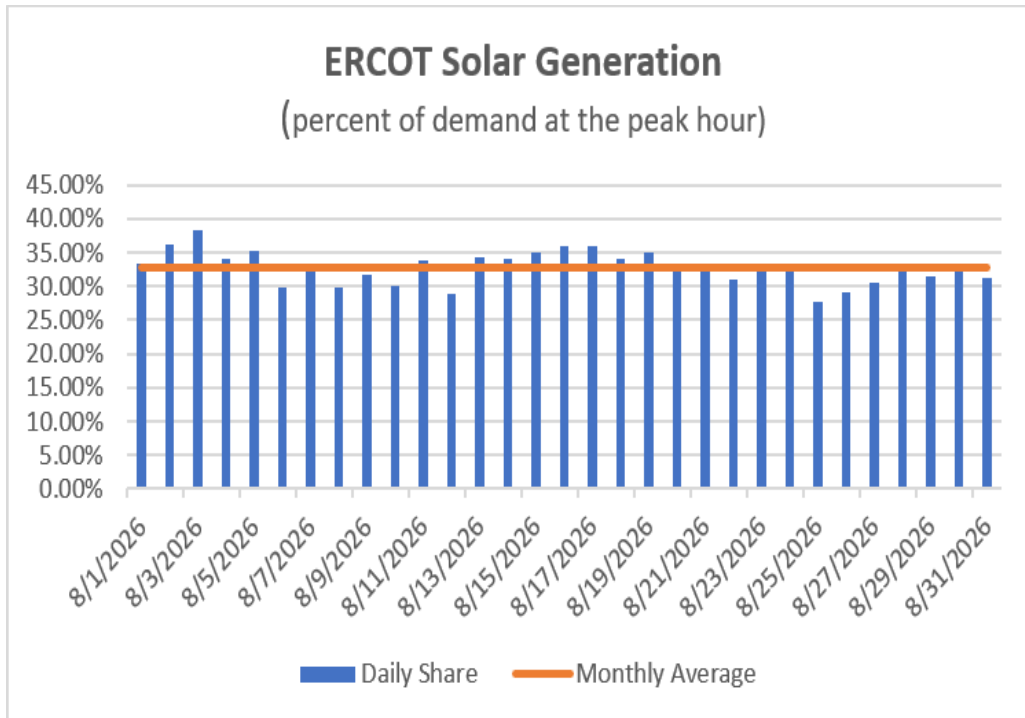


Europe's Nuclear Drought

- All three had major operational problems this summer due to the heat and drought that affected the continent
 - Paks, which supplies ~40% of Hungary's power, sharply cut generation in August
 - Kozloduy, which supplies ~35% of Bulgaria's power, also cut generation in August
 - Cernavoda, which generates ~20% of Romania's electricity, was shut down in mid-August and was still offline in early September
- Problems also surfaced elsewhere
 - France reduced generation at 13 of its 57 reactors in mid-August, cutting output by 20%, continuing a trend of problems with high cooling water temperatures and other environmental issues in the past decade
 - Switzerland took its Beznau reactor offline in both June and July due to high cooling water temperatures
 - Slovenia reduced operations at its Krsko reactor

ERCOT's Solar Success

- Solar had no problems in ERCOT, the grid serving 90% of Texas demand
- Daily peak demand averaged almost 88,000 MW in August – 5,000 MW above the previous daily average for a month set in 2023
- Solar supplied almost one-third of that peak demand daily



Source: ERCOT data, IEEFA calculations

Europe's Nuclear Drought



Source: *Inquam Photos/George Calin via REUTERS*



The temperature increases within Europe have been among the highest in the world. So Europe would see some of these impacts first.



Brent Wanner, head of the International Energy Agency's power sector unit



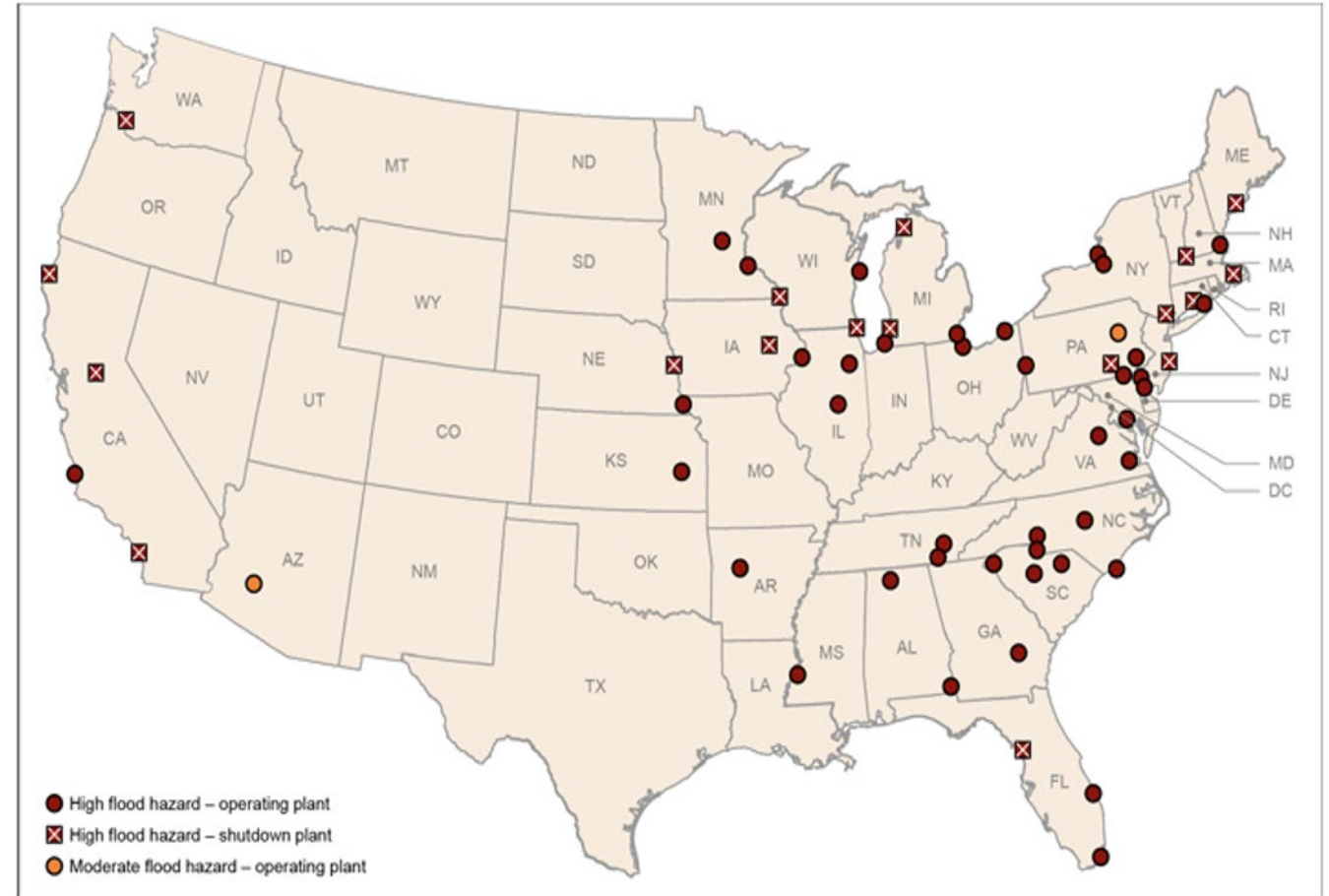
Europe's Nuclear Drought

- Nuclear proponents are already trying to dismiss this summer's drought-related problems
 - Jacopo Buongiorno, head of MIT's nuclear reactor lab, told Canary Media that no one knew about “the dramatic changes in river flow rates and temperatures that we are witnessing now” when the plants were built
 - That may/may not be true, but clearly it highlights the uncertainty going forward: What will droughts and water availability look like in 60-80 years?
 - Buongiorno also dismissed the problems as only reducing the plants' annual capacity factor by “a few percent”
 - But if that happens at the height of a heat wave when the power is most needed, then nuclear is not nearly the reliable source it's sold as

U.S. Nuclear Flood Risks

- General Accounting Office report in 2024 found that 40 operating U.S. nuclear reactors are located in high flood hazard areas, and two others are in moderate flood hazard zones

Figure 6: Nuclear Power Plants Located in Areas with High and Moderate Flood Hazard

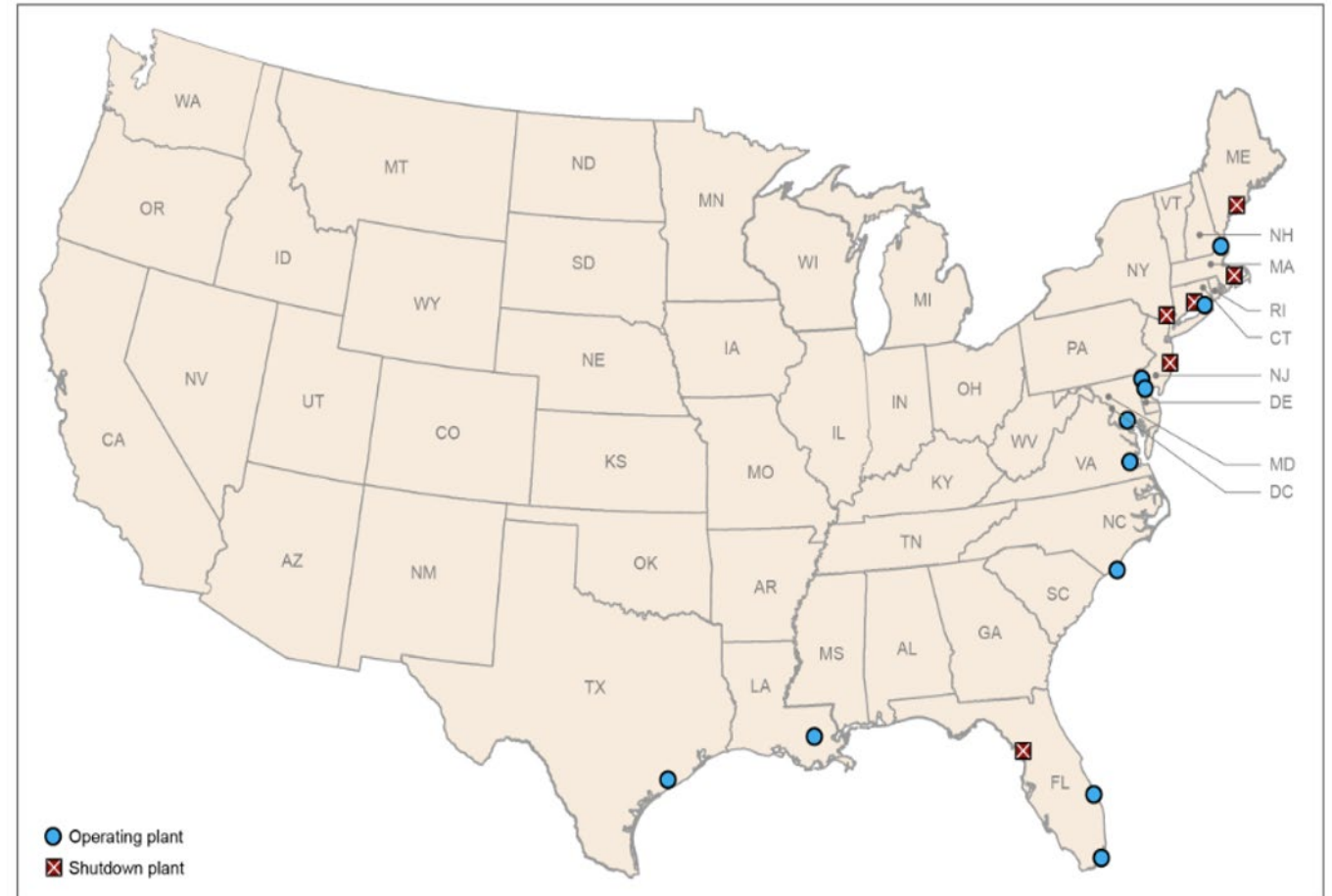


Sources: Federal Emergency Management Agency and Nuclear Regulatory Commission data; U.S. Census Bureau (map). | GAO-24-106326

U.S. Nuclear Flood Risks

- GAO report also found that 11 operating plants and six closed units are in areas that may be hit with storm surge from a Category 4 or 5 hurricane

Figure 7: Nuclear Power Plants Located in Areas with Exposure to Storm Surges from Category 4 and Category 5 Hurricanes



Sources: National Oceanic and Atmospheric Administration and Nuclear Regulatory Commission data; U.S. Census Bureau (map). | GAO-24-106326



NRC's processes for licensing and overseeing nuclear power plants include actions to address risks from natural hazards. However, NRC's actions do not fully consider the potential effects of climate change.



General Accounting Office

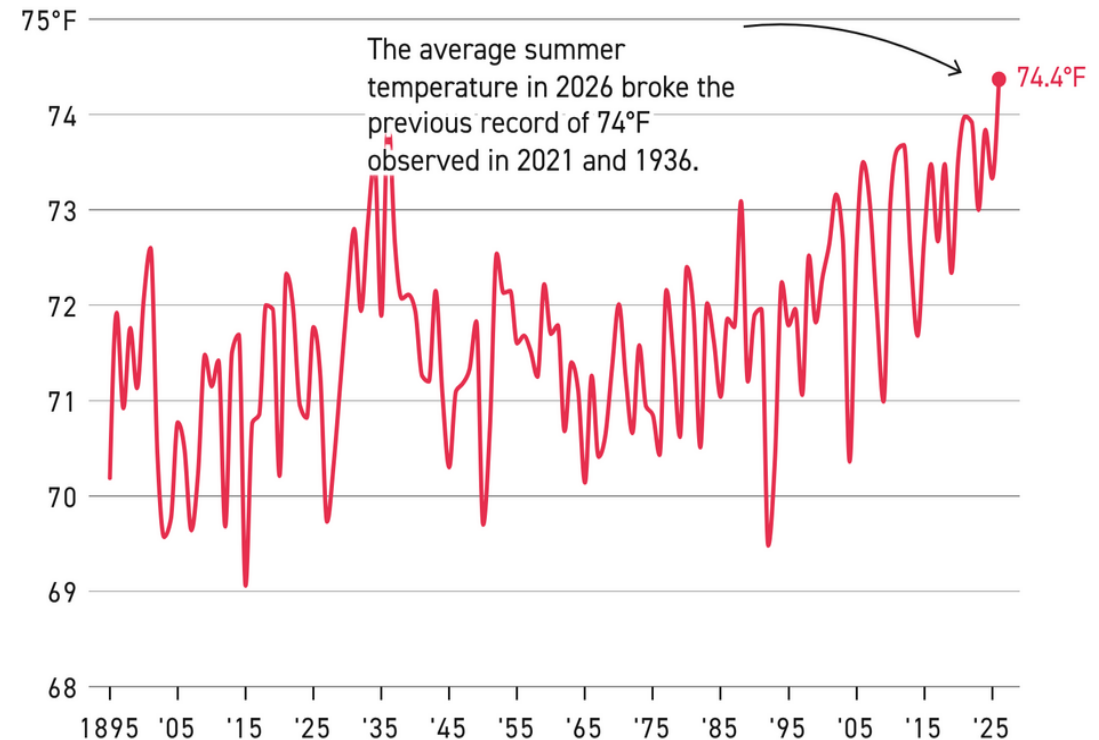


Potential Impacts

- U.S. summer temperatures set a record high in 2026
- Trend has been going upward steadily for 30 years
- This rise, and its impact on water resources, must be factored into all planning for new nuclear power plants

This year's average U.S. summer temperature set a record

Average continental U.S. summer temperature, June through August, each year since 1895



Source: NOAA
Thomas Frank/POLITICO



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