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Criticality Is Not a Customer

What stands between new nuclear and its first hyperscaler contract.



By Bijay Alex Mathew · SonTeno · The Offtake

Edition 1.0 · Data as of October 18, 2026 · Not investment advice

Every factual claim carries a source note. Every source tagged by interest.

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What stands between new nuclear and its first hyperscaler contract

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Four privately developed reactors reached first criticality in the thirty days to July 4, 2026, all four at zero power, and a fifth followed in August. The physics works, and the capital is there: more than $4.5 billion of venture investment reached 81 nuclear companies globally by late July 2026. Neither has yet become a business. **No hyperscaler has signed a binding long-term power purchase agreement for a new-build advanced reactor.** The only new-build contracts so far come from TVA, PacifiCorp and the US Army.

The full report reads the evidence as a loop. Lenders will not finance a first plant without a signed contract, and buyers are reluctant to sign until cost and schedule are proven. This briefing condenses a 147-page report that assesses seven constraints on new nuclear and eight companies against them, and every figure is sourced there.

Constraint	Where it actually stands
Fuel	The shortage is time, not uranium. Russia supplied 26 percent of the enrichment US reactors bought in 2025, and the waivers that allow those imports end in January 2028. Replacement capacity at scale arrives between 2029 and 2036.
Regulatory	Regulatory standing predicts little. Work done under the faster federal pathways does not yet count toward a commercial license; the rule that would allow it is still only proposed.
Workforce	The binding shortage is welders, machinists and inspectors, not engineers. Six of the eight companies assessed disclose no program to address it.
Manufacturing	Eleven of 24 developers describe building reactors in factories. Three have published both a factory they control and a production rate.
Industrial supply chain	Field construction broke the last cycle: MIT's model of the next AP1000 assumed indirect costs of 51 percent of overnight cost, and worked against Vogtle's realized costs they come to 68 to 76 percent. No current public count of qualified suppliers exists; the last, Sandia's 683 certificates in June 2020, counted certificates, not companies.
Offtake	**Least resolved, because it has no precedent.** No hyperscaler has signed a binding PPA for a new-build advanced reactor. The count is zero, not low, against about 6.9 GW contracted from existing plants.
Permission	Nuclear is near its all-time high in national polling. Opposition to a data center nearby rose from 42 to 75 percent in a year, with two other pollsters that year at 63 and 71 percent.

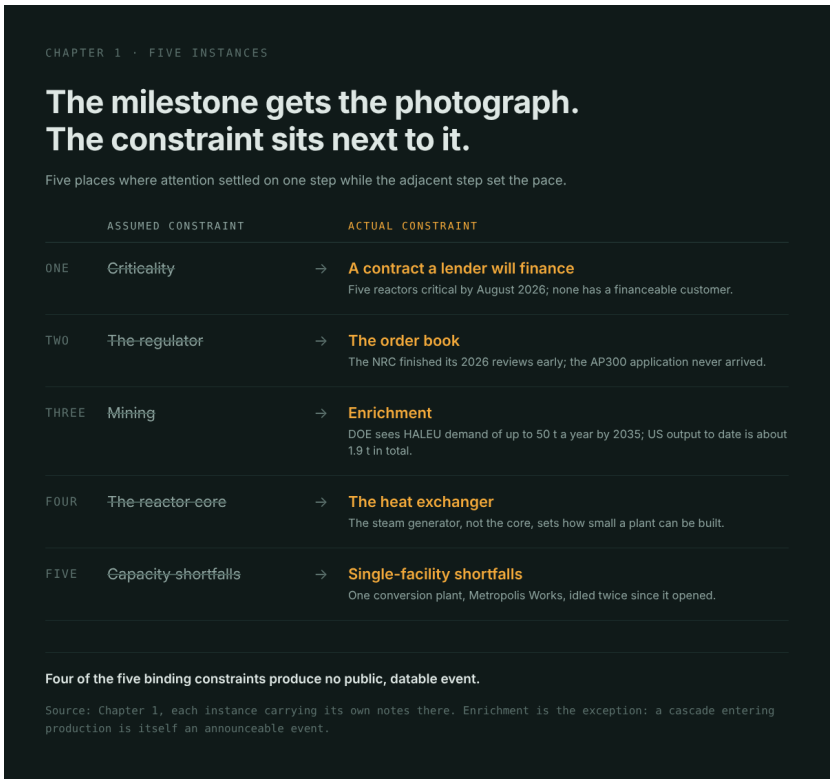
The pattern: the milestone is not the constraint

Across the sector, attention settles on one step as the hard part, while the step that limits progress sits beside it and makes no headline. The full report finds it five times.

Criticality was photographed; the contract was not. The regulator was blamed; Westinghouse's AP300 is waiting on an order book, not on the NRC. Mining was the worry; enrichment is the gap. The reactor core was rendered; the heat exchanger decides how small a plant can be. A shortage of capacity was expected; the real exposure is a single conversion plant in Metropolis, Illinois, whose idling from 2017 to 2023 left the country with no operating conversion capacity.

The pattern repeats because four of these five constraints produce no datable event. A criticality has a date, a place and a press release. An unsigned contract has none of those.

> **Criticality was photographed; the contract was not.**



Offtake: read the instrument, not the headline

Nine legal forms circulate under the label “nuclear deal,” and they transfer very different amounts of risk:

- signed PPAs against existing or restarting plants, such as Microsoft at Crane, Amazon at Susquehanna and at Calvert Cliffs, Meta’s 2,609 MW with Vistra, and Google’s October 2026 Constellation agreement for 890 MW of uprates
- PPAs for clean energy attributes rather than physical power, such as Meta at Clinton
- utility PPAs with a hyperscaler standing behind them, such as Kairos, TVA and Google at Hermes 2
- development funding with an offtake right, such as Meta and TerraPower’s Natrium units
- non-binding frameworks, such as Oklo’s 12 GW agreement with Switch, and the Holtec, Entergy and Hyundai memorandum of August 2026
- leases for compute rather than contracts for power, such as Fermi America’s 222 MW agreement with TensorWave, which had not closed and whose conditions include securing construction financing; AMD agreed on October 13 to provide credit support for the lease
- funding and rights against reactors that do not exist, such as Meta’s January 2026 commitments across three counterparties
- options without obligations
- equity, prepayments and guarantees

Only the first kind is a firm contract for physical power, and every instance of it buys from a plant that already exists or is restarting. What separates the nine forms is not who the buyer is but what the instrument does: the other eight transfer development capital, options, equity or guarantees rather than an obligation to buy power at a price. That contracting reached about 6.9 GW of disclosed capacity against existing US plants by October 6, 2026, about 1.6 GW of it on two days, while new-build stayed at zero. Google’s own explanation: “the fastest new megawatt is often the one that can be provided by existing infrastructure.” Hyperscaler money has recapitalized the existing fleet and not yet financed a single new advanced reactor.

CHAPTER 7 · DEAL MAP

Where the deals actually sit.

Twelve nuclear-for-AI deals by technology maturity and grid connection.



One deal sits in the first-of-a-kind, behind-the-meter corner, and it is a partnership, not a contract.

Source: Chapter 7 and its notes. Placement is this report's classification; the instrument behind each deal is set out in the chapter.

Hyperscaler contracts: five obstacles stand in the way

No hyperscaler has said why it has not signed. The obstacles below are the full report's reading.

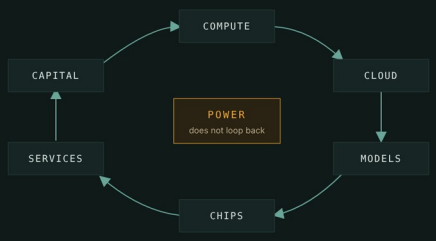
- **Timing.** Hyperscalers need power inside this decade. The earliest new advanced reactor with a named buyer, Kairos at Hermes 2, is targeted for 2030; PacifiCorp's filing gives fall 2031 for TerraPower's Kemmerer Unit 1, while its own regulatory modeling assumes 2032. Existing plants and restarts arrive sooner.
- **Cost and schedule.** A first-of-a-kind reactor has no cost history to price a twenty-year contract against, and the last generation of American projects ran years late and billions over budget. Lazard's July 2026 benchmarks put new-build nuclear at $175 to $255 per MWh and gas combined cycle at $51 to $129, and mark small modular reactors with a single illustrative point of about $214, which Lazard states is not directly comparable to the other technologies given expected commercial operation dates of 2030 and beyond. The cheapest nuclear megawatt on the same chart is a restart, at about $71.
- **The instrument.** A PPA prices output from a plant. Before the plant exists, a buyer can usefully offer development capital, an option or equity, and hyperscalers have offered exactly that.
- **Fuel.** Twelve of 24 developers depend on HALEU, which is rationed. Eight use standard low-enriched uranium at five percent or below. Four sit outside both groups, two of them in the five to ten percent band where material can be bought but fabrication and transport licenses are still being written.
- **Permission.** The data centers that would use the power are losing local support.

The capital structure reflects the loop. Private money has gone to companies, mostly as equity, with at least one corporate credit facility, and none of it is a loan against a plant. Hyperscalers do sign 20-year contracts for new generation when it arrives this decade: Microsoft did in June 2026, for a 2.67 GW gas plant in West Texas. The only project-level debt is federal, and it goes to restarts and, conditionally, to the AP1000 supply chain, not to new advanced reactors.

CHAPTER 7 · THE FINANCING WEB

Money circulates among AI companies. Power plants are the one input it does not loop back into.

What the AI financing web does not reach.



$200B · $185B

Amazon and Google, expected data center spending for the year ahead, as told to investors in February 2026.

$700M · $650M

X-energy's round anchored by Amazon, whose own share is undisclosed; TerraPower's raise, which Nvidia's venture arm joined.

$105B

Cap on Nvidia's residual value guarantee for an OpenAI campus in Ohio, which OpenAI has agreed to reimburse.

Money can move in a circle indefinitely. A megawatt has to be built once, on a schedule nobody in that web controls.

Sources: Chapter 7 notes 22, 23 and 25: company disclosures and SEC filings. Original analysis, not a reproduction of any published chart.

Fuel: short of time, not uranium

The fuel chain has four steps: mining, conversion, enrichment and fabrication, with deconversion inside the last. Mining is not the constraint, and conversion happens at one plant. Enrichment is the gap, a rare case where the obvious constraint really binds, and it is where federal money went: $2.7 billion in January 2026.

The catch is timing. Russia supplied 26 percent of the enrichment US operators bought in 2025, and the waivers that allow those imports end on January 1, 2028. Apart from a small Urenco addition in 2027, every funded remedy arrives between 2029 and 2036. For advanced reactors, HALEU is scarcer still. In its first round, DOE allocated material to five of fifteen applicants.



Regulatory: the fast lanes buy demonstrations, not licenses

The NRC has changed. It approved TerraPower's Natrium construction permit ahead of schedule, finished Kairos Hermes 2 in 10 months against 14 planned, issued TVA a construction permit for a BWRX-300 at Clinch River on September 28, 2026, about seventeen months from application to authorization against about thirty for Ontario's Darlington BWRX-300 license, and put its new Part 53 framework into effect in April 2026. The fast lanes, DOE's Reactor Pilot Program, the Launch Pad and the Army's Janus Program, produce test reactors and demonstrations, but no license to sell power.

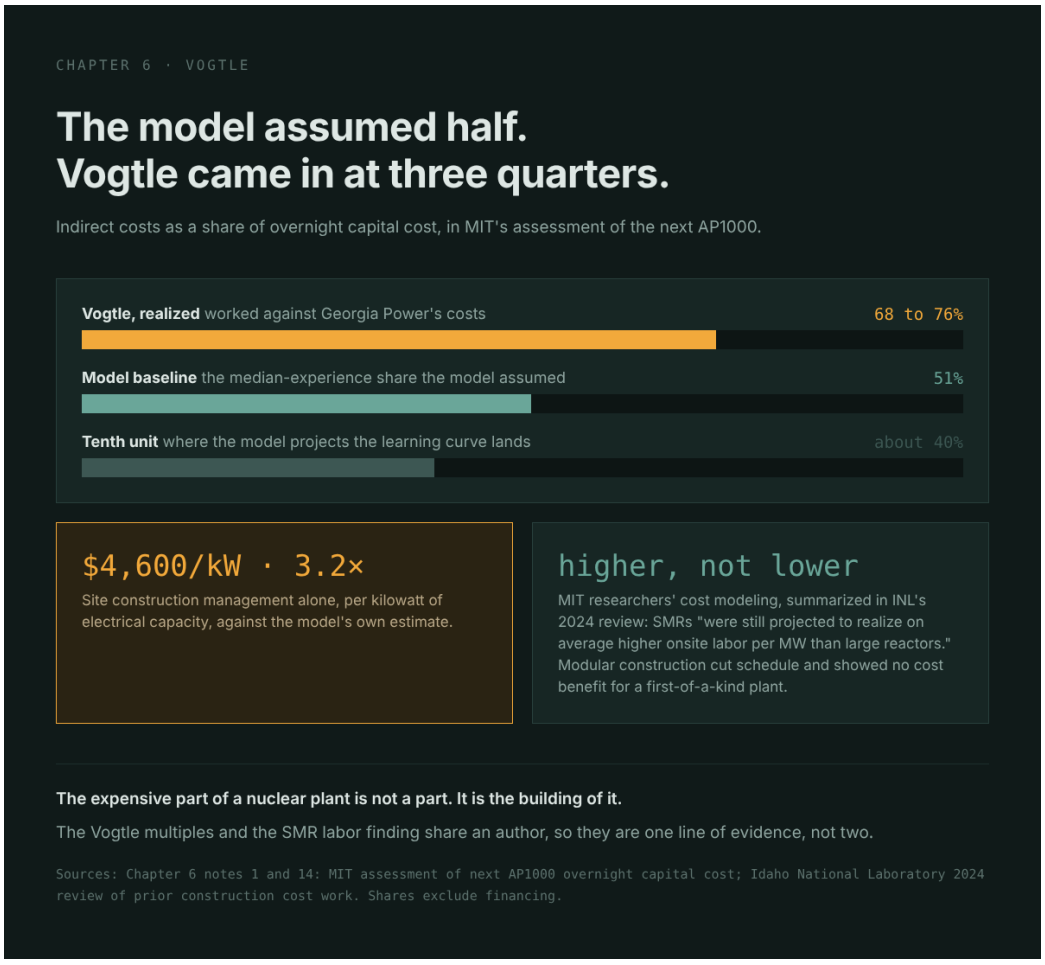
No single lane delivers a complete outcome, so companies run several at once. Eight of the ten Reactor Pilot companies are also in NRC pre-application. The rule that would let fast-lane work count toward a commercial license is still only proposed.



Manufacturing and industrial supply chain: few factories, costly fieldwork

Eleven of 24 developers say they will build reactors in factories. Three, Radiant, Aalo and Antares, have published both a facility they control and a production rate. The rest range from mass-production language without a plant to supplier deals. Where these companies diverge is fuel: twelve depend on HALEU, eight on standard low-enriched uranium at five percent or below, and four sit outside both groups.

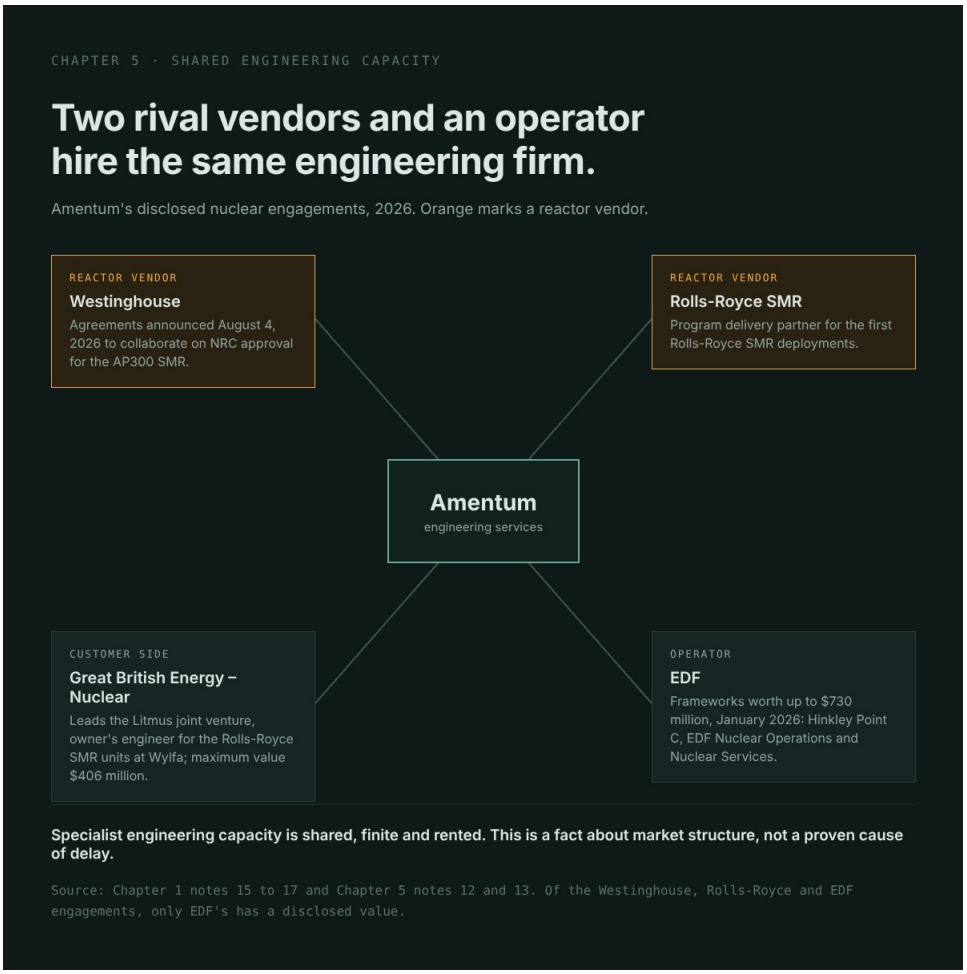
Field construction, not component prices, broke the last generation of American projects. MIT's model of the next AP1000 assumed indirect costs of 51 percent of overnight cost, the figure a reference database sets for a median-experience plant. Worked against Vogtle's realized costs they run 68 to 76 percent, and site construction management alone rose 3.2 times against the model's own estimate.



Workforce: the shortage is in the trades

Nuclear engineering doctorates reached a record in 2022 while bachelor's degrees fell 25 percent between 2012 and 2022. That imbalance is real but secondary. The most detailed 2026 supply chain assessment finds shortages of nuclear-qualified machinists, welders and inspectors now govern throughput, schedule and execution risk. The Department of Energy's workforce board finds that quadrupling nuclear capacity will require tripling the workforce.

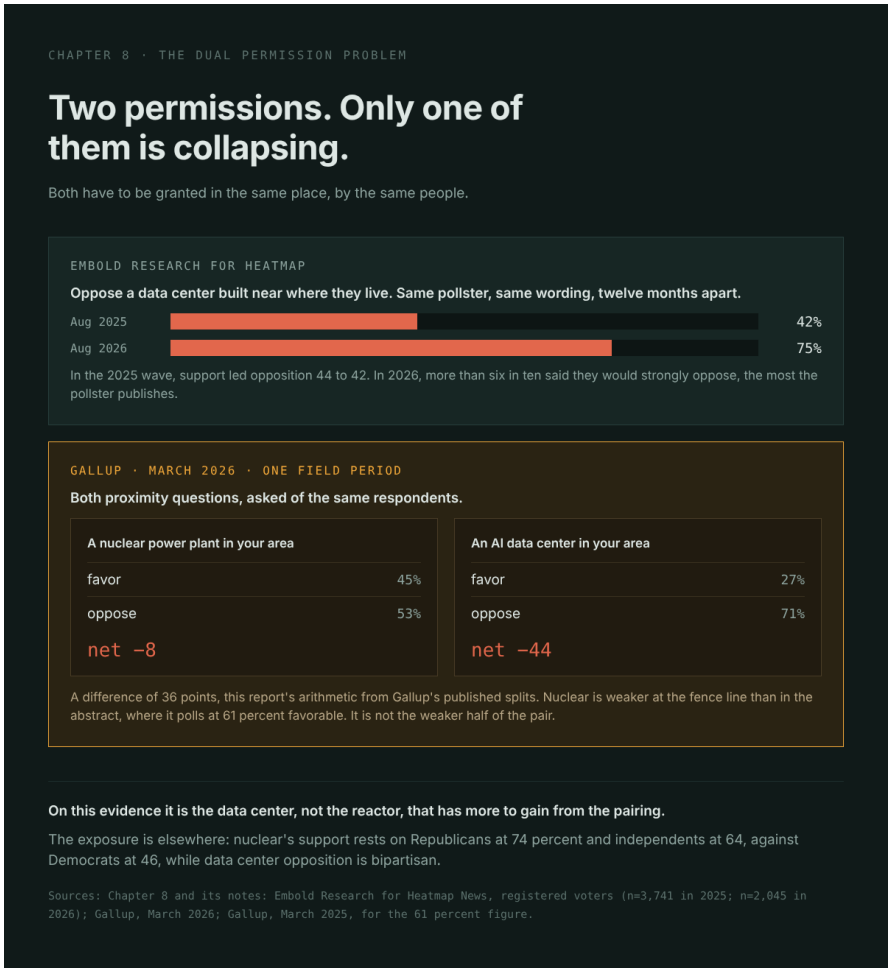
Specialist engineering is shared too. Amentum works for Westinghouse, Rolls-Royce and EDF at once.



The response has started. Kairos's NuCAMP consortium includes community colleges, and the 2026 national security technology strategy names advanced reactor construction as a field for new credentials.

Permission and defense: local resistance, a limited runway

Nuclear is winning the national argument and data centers are losing the local one. Asked about a facility in their own area, Americans oppose a nuclear plant 53 to 45 and an AI data center 71 to 27. Capital in blocked or delayed data center projects reached $130 billion in a single quarter. The report argues, and labels it as argument, that behind-the-meter nuclear could answer the largest objections, power and water, because it never touches the grid, the second of them only where the plant and the data center are both cooled without a municipal draw.



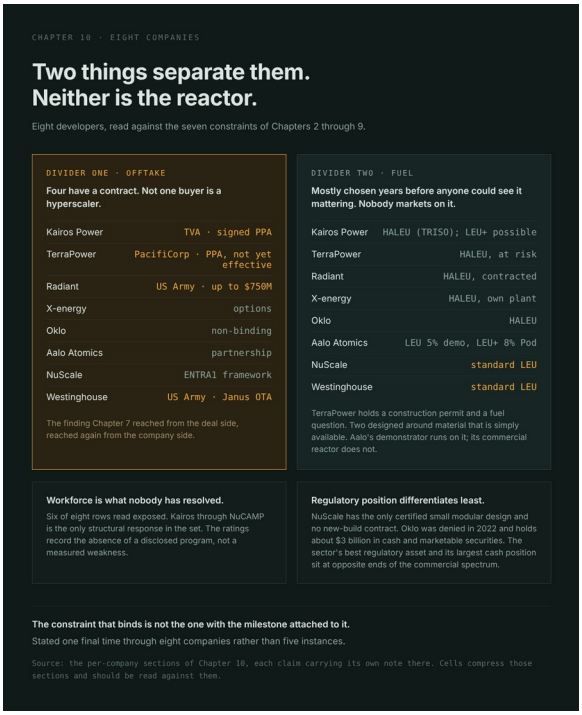
The Army's Janus Program commits up to $2.2 billion across five vendors and five bases, with a September 30, 2028 deadline for a first reactor. It is a runway, not a market. An Army-regulated reactor cannot pivot to commercial customers on its Army authorization.

Companies: offtake and fuel divide the eight

	Fuel	Regulatory	Workforce	Mfg	Supply	Offtake	Siting
Kairos	HALEU; LEU+ possible	NRC, building	Addressing	Demonstrated	Exposed	**PPA, TVA**	Grid
TerraPower	HALEU, at risk	NRC permit	Exposed	Not factory	Exposed	**PPA, PacifiCorp***	Grid
Radiant	HALEU, contracted	Four lanes	Exposed	Building	Exposed	**Army contract**	Base
X-energy	HALEU, own plant	NRC pending	Exposed	Supplier	Partial	Option	Grid
Oklo	HALEU	Denied 2022; DOE pilot, NRC pre-application	Exposed	Own, operate	Exposed	Non-binding	Mixed
Aalo	LEU 5% / LEU+ 8%	DOE pilot	Exposed	Factory	Exposed	Partnership	Behind meter
NuScale	LEU	US600 certified; US460 SDA	Exposed	Supplier	Exposed	Framework	Grid
Westinghouse	LEU	AP300 stalled	Shared firm	Field	Federal loans	LOIs; **Janus OTA**	Grid

Bold marks a signed contract, and there are four: two utility PPAs and two Army agreements, none of them with a hyperscaler. The PacifiCorp agreement is executed and becomes effective only once the commission approvals the contract names are in hand, among them approval of a related water use agreement. Oregon, Idaho and Utah granted their approvals between April and June 2026; a California application was still active on October 11, 2026, the last date its docket was checked, and the contract does not publish the full list. Each cell is a one-word label for an assessment the full report sets out at length: fuel in Chapter 3, regulatory in Chapter 4, workforce in Chapter 5, manufacturing and supply chain in Chapter 6, offtake in Chapter 7, siting in Chapter 8, and all eight companies, cell by cell, in Chapter 10. “Denied 2022” and “AP300 stalled” are shorthand for arguments made there, not verdicts. This is not a ranking. Workforce and supply chain read Exposed almost everywhere because they are sector-wide.

Offtake separates these companies most clearly, and fuel choice is the second divider.



What to watch. The crunch comes in 2028. Four dated tests fall in 2028, across three constraints. The Russian waivers expire on January 1 and funded replacement capacity arrives from 2029, and Raven-Flint's conversion services for Aalo are due to begin, which is fuel. Radiant's factory has to deliver, which is manufacturing. The Army's deadline for a first operating reactor falls on September 30, which is offtake. Only one event would change the conclusion, a signed, binding, long-term power purchase agreement between a hyperscaler and a new-build advanced reactor.

About this briefing. Condensed from *Criticality Is Not a Customer*, The Offtake Research Series, Volume I, Edition 1.0, data as of October 18, 2026. The full report runs to 156 pages and carries every source, tagged by interest and archived, with each chapter's notes at the end of that chapter; its Disclosures section sets out the author's relationships with companies covered, including Aalo Atomics. This briefing contains no investment recommendations. The companion dataset, The Offtake Nuclear Register (October 2026 edition), is at docs.google.com/spreadsheets/d/1WYGG9aLA39dohvVrg9N7vHeg6g2tnRWe7y9PS3Uq0tI. Latest edition and corrections: sonteno.com/research/criticality-is-not-a-customer. Contact: bijay@sonteno.com. © 2026 Bijay Alex Mathew and SonTeno LLC. Quote freely with attribution to the edition. Not for redistribution, resale, or inclusion in a commercial product without permission.

Figures from the full report

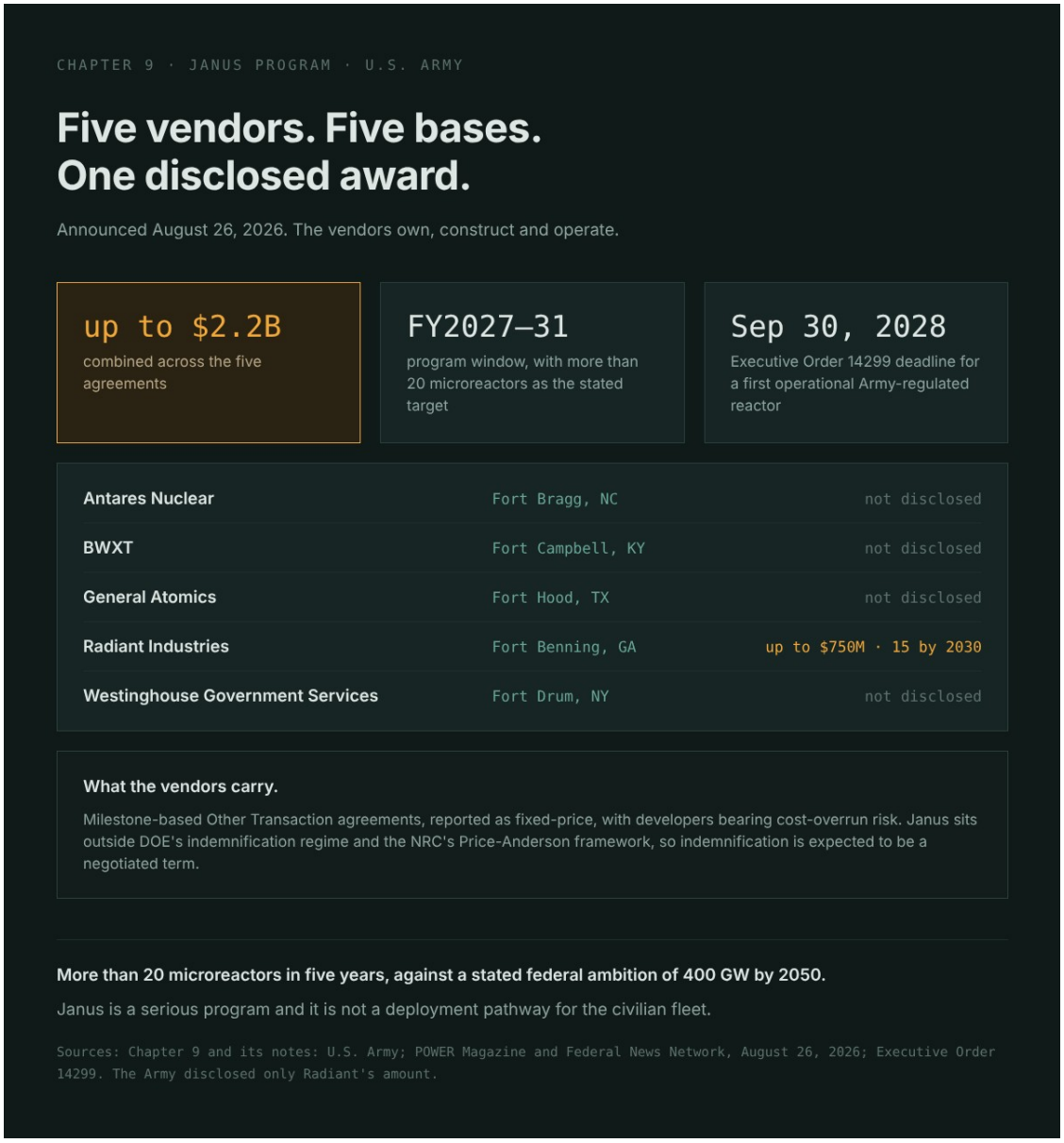
The remaining figures from the full report, each with the finding it shows.



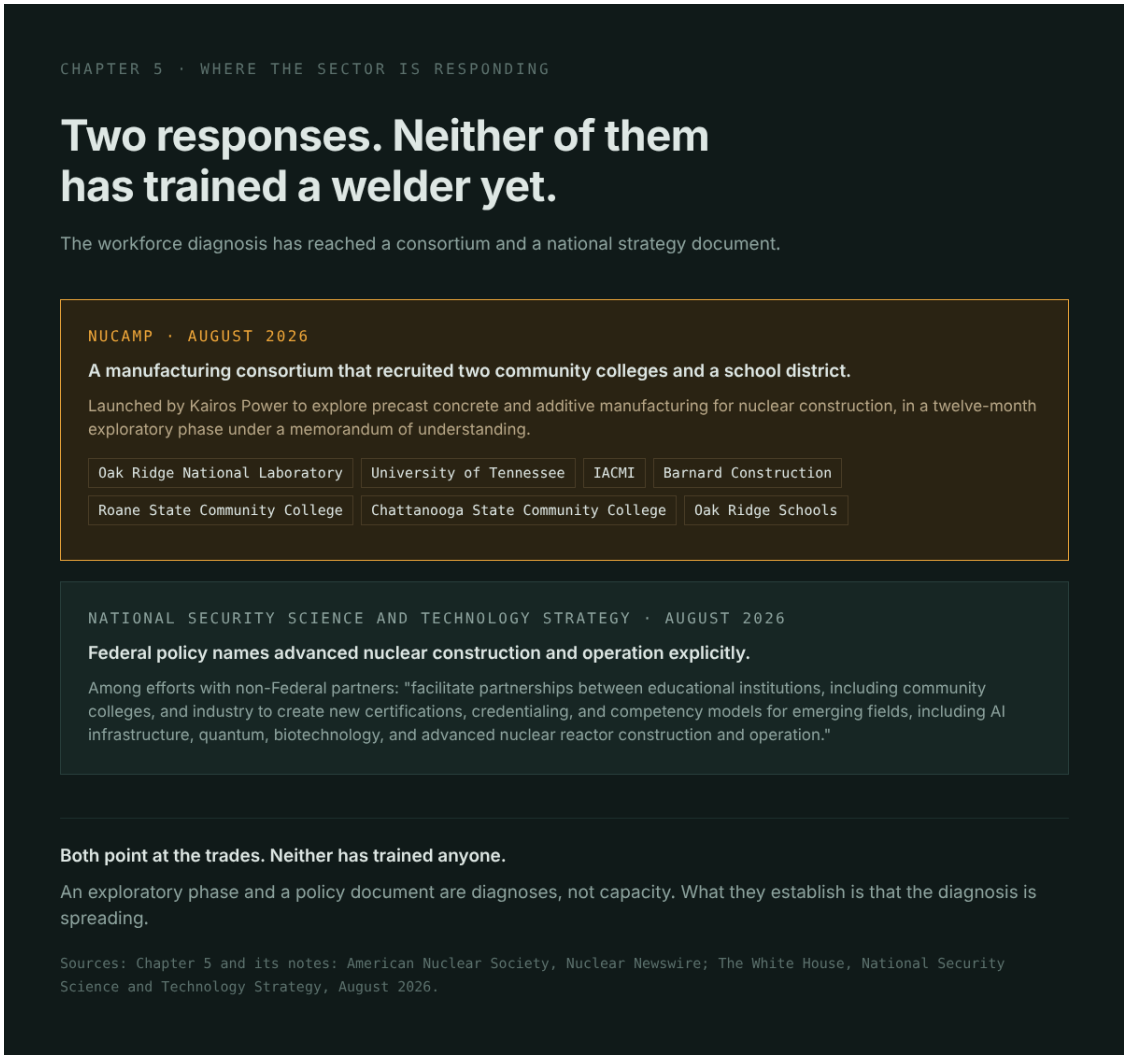
Most funded fuel remedies arrive after the January 2028 deadline they were meant to meet. Chapter 11.



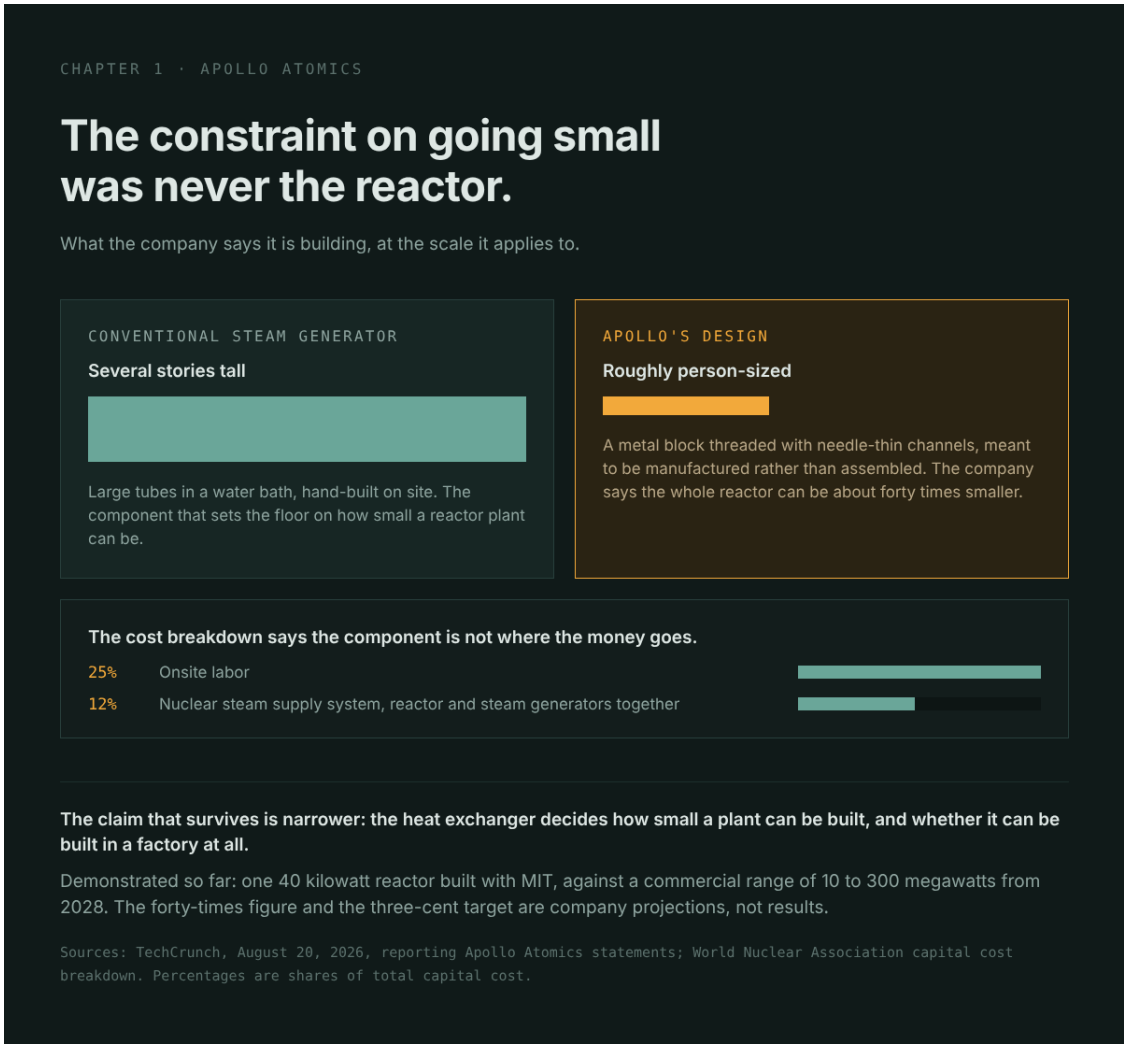
Sorted three ways, the 24 developers split into seven coolant families, three factory bets with a production rate, and twelve dependent on rationed fuel. Chapter 2.



The Army’s Janus Program: five vendors, five bases, one disclosed award. Chapter 9.



The response to the trades shortage so far is a consortium and a strategy document, not trained workers. Chapter 5.



The heat exchanger, not the reactor core, sets how small a plant can be built. Chapter 1.