
INDEPENDENT CASE STUDY

The Google-CFS Power Purchase Agreement

A Data Center Case Study

When the operator builds the plant: fusion offtake,
hyperscale demand, and Virginia's energy market

Companion to What Virginia Is Spending, What Virginia Is Getting

Fusion

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CASE STUDY: THE GOOGLE-CFS POWER PURCHASE AGREEMENT

When the Operator Builds the Plant: What the Fusion PPAs Mean for Virginia's Energy Market

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PURPOSE AND SCOPE

This case study documents the power purchase agreements between Google, Eni, and Commonwealth Fusion Systems and their implications for Virginia's energy market structure, ratepayer cost allocation, and data center infrastructure policy. It is not a technology profile. Readers looking for tokamak physics, magnet specifications, or plasma confinement details will not find them here. What they will find is an institutional and fiscal analysis of the commercial arrangements themselves, the regulatory pathways that make them possible, the allocation of risk among operator, developer, utility, and ratepayer, and the precedent the deals set for how data center demand is restructuring who generates power, who buys it, and who pays for the grid infrastructure that connects them. The report does not advocate for or against fusion, for or against the Google-CFS arrangement, or for or against operator-anchored generation as a model. It is designed to be analytically useful whether the ARC plant delivers in 2031 or never.

Since the prior version of this report (v1.7, March 2026), the record has moved in three ways that justify a major revision. First, CFS became the first fusion company to apply for interconnection with a major grid operator, entering PJM's reformed queue in April 2026 and giving the project's site a name: the Fall Line Fusion Power Station. The interconnection timeline now stands alongside the physics as a binding constraint on the delivery date, and this report treats it that way. Second, the offtake picture has resolved from one buyer to two. Eni's power purchase agreement, announced September 22, 2025 and valued by the companies at more than \$1 billion, was not carried in v1.7; this version incorporates it and the comparison it invites between a technology-strategic buyer and an energy-major buyer pricing the same unbuilt plant. Third, the conventional-generation backdrop has hardened: the GS-5 rate class order, the CERC litigation now before the Supreme Court of Virginia, a revised Dominion resource plan, two more record capacity auctions, and a proposed \$66.8 billion acquisition of Dominion Energy itself.

The case study is written to serve three audiences. First, researchers studying the energy, environmental justice, and socioeconomic implications of data center growth, including the research team of the Alfred P. Sloan Foundation study on the energy implications of data center expansion in Georgia, Virginia, and Tennessee. [1] Second, Virginia policymakers, State Corporation Commission staff, and utility regulators evaluating how operator-anchored generation changes the grid planning and ratepayer cost allocation frameworks the Commonwealth has relied on for decades. Third, citizens and journalists seeking to understand the relationship between data center demand, new generation capacity, and residential electricity costs.

A note on lane discipline. The companion county study, *Chesterfield County: The \$0.24 Rate, the Thirty-Year Lock, and the Two-Corridor County* (v3.0, June 2026), owns the land-use record, the economic development mechanics, the local fiscal terms, and the county's two-corridor politics. This report owns the deal and the technology bet: the PPAs' structure and risk allocation, the fusion timeline they depend on, the offtaker strategy, the grid integration path, and what a speculative generation source means for a hyperscaler's energy book and for Virginia's data center energy story. Where the two reports touch, the fact is stated once here and the county record is cited rather than duplicated.

SECTION 1: THE DEALS

On June 30, 2025, Google signed a power purchase agreement with Commonwealth Fusion Systems for 200 megawatts of electricity from CFS's planned ARC fusion plant in Chesterfield County, Virginia.[2] The agreement represents half the ARC facility's projected 400 MW total output. It is the largest corporate power purchase agreement for fusion energy ever executed.[3]

The structural significance of the deal is not the megawatts. It is the mechanism. The Google-CFS PPA is a bilateral private contract between a power consumer and an independent generator. Google is not buying power from Dominion Energy Virginia, its regulated utility. It is contracting directly with a developer that will build a plant on land leased from Dominion and connect to the Dominion grid through a switchyard on Dominion-managed property.[4] The traditional pathway for procuring new generation in Virginia runs through the utility, the State Corporation Commission, and the ratepayer cost recovery framework. This deal bypasses all three.

The PPA provides CFS with something no fusion company had ever had: a bankable revenue commitment from a creditworthy offtaker.[5] Project finance for a first-of-its-kind energy facility requires more than investor enthusiasm; it requires a contracted buyer whose credit quality and purchase commitment make the revenue stream financeable. Google's balance sheet and long-term offtake commitment provide exactly that. The agreement also includes options for Google to purchase power from future ARC plants, suggesting a fleet deployment model rather than a one-off transaction.[6]

Google's dual role deserves precision, because v1.7 compressed it. Google has been an equity investor in CFS since the 2021 Series B round and increased its stake as part of the June 2025 strategic partnership.[7] The \$863 million Series B2 round in which that increased stake formally landed was announced separately, on August 28, 2025, with Google, Nvidia's venture arm, Eni, Gates Frontier, and a consortium of Japanese investors led by Mitsui and Mitsubishi participating.[8] Google is both an owner of the developer and a contracted buyer of its output. This dual role is common in venture-backed energy but unusual in regulated utility markets, where the buyer and the generator are expected to maintain arm's-length commercial relationships.

The second offtaker

On September 22, 2025, Eni and CFS announced a power offtake agreement that the companies jointly valued at more than \$1 billion, covering power from the same first ARC plant.[9] The megawatt quantity, contract term, and price were not

disclosed; the only volume signal in the public record is CFS's own statement, the same day, that Google's 200 MW plus Eni's undisclosed share together commit "more than half" of the plant's 400 MW.[10] Eni is not a new arrival. It was among CFS's first institutional investors in 2018, signed a technological collaboration framework with CFS in 2023, and increased its equity stake in the Series B2 round. The PPA converts that technological and financial relationship into a commercial one.[9]

The prior version of this report treated the disposition of the non-Google 200 MW as one of the most consequential unknowns in the public record. That framing was already stale when v1.7 was published in March 2026: the Eni agreement had been public for six months. The correction is worth making visible rather than silently absorbing, because it illustrates the report's own discipline about evidence dates. The unknown has not disappeared; it has shrunk. Something between zero and roughly 200 MW of ARC's output remains uncommitted, and the Eni tranche's size and terms are undisclosed.

The two-offtaker structure invites the comparison this report exists to make. Google is a technology-strategic buyer: an equity investor procuring firm carbon-free power for its own load, six miles from the plant, under a 24/7 clean energy commitment that no available technology currently satisfies at scale. Eni is an energy-major buyer: an investor since 2018 whose director of technology has said the company would resell the power as it does its other U.S. generation.[11] One buyer is hedging its load growth and its carbon ledger; the other is buying a merchant position in a technology it part-owns. That two such different institutions priced the same unbuilt plant within three months of each other is the strongest market signal fusion has yet produced. What it is not is evidence the plant will run. Both contracts are anchored on SPARC, the demonstration machine in Massachusetts, achieving net fusion energy first.[2][9]

One more equity development postdates v1.7. On June 11, 2026, CFS announced that Plynth Energy, an Abu Dhabi government-owned fusion-focused investment fund, had acquired a minority stake in the company for an undisclosed amount.[12] CFS's total capital raised now exceeds \$3 billion, which the Fusion Industry Association's reporting puts at nearly one-third of all private investment in the global fusion sector.[13]

SECTION 2: THE PLANT

The site has a name now. On April 28, 2026, CFS announced that the ARC plant site in Chesterfield County would be called the Fall Line Fusion Power Station, after the geological boundary where the Piedmont drops to the Tidewater coastal plain and produces the rapids on the James River.[14] The name does some quiet geographic work: it ties the world's first commercial fusion plant to the same river-industrial corridor that hosted the coal-fired Chesterfield Power Station for eight decades and that will host the CERC gas peaker. The energy geography framework in the Sloan study will recognize the pattern. Generation bets, fossil and post-fossil alike, keep landing on the same few square miles of already-industrialized riverfront, because that is where the switchyards, the transmission, the water, and the zoning already are.

The facility is planned for a 94-acre site at 1201 Battery Brooke Parkway in the James River Industrial Center, on land owned by Dominion Energy Virginia, with CFS holding an option-to-lease.[15] Early announcement materials described the parcel as 100 acres; the county zoning record says 94, and this report uses the zoning figure.[16] Dominion provides technical and development support under a joint development agreement, but the plant is not a Dominion asset. CFS is the developer, owner, and operator. The distinction matters for everything that follows, because it determines who bears the costs and who captures the revenue. The full land-use record, including the conditional use permit's conditions and the surrounding corridor's by-right development history, is in the companion county study.[17]

CFS estimates the total project cost at \$2.5 billion.[18] The plant is designed to produce 400 MW of net electricity as firm baseload power.[19] For the energy market analysis that matters here, "firm" means the plant can run continuously and dispatch power around the clock without dependence on weather, battery storage, or grid-balancing mechanisms. If it works as designed, the ARC plant would deliver what no existing renewable source can deliver at this scale without substantial supplementary infrastructure.

Permit-by-permit status

CFS has stated that construction begins only after state, local, and federal permits are in hand.[20] The table below is the report's accounting of that stack as of the evidence date. Checked negatives are entries where targeted searching found no public record; they are reported as absences, not as confirmed facts.

Approval	Authority	Status, June 12, 2026
Conditional use permit	Chesterfield County Board of Supervisors	Granted September 17, 2025, unanimous; the first CUP for a commercial fusion plant anywhere[17] [21]
Site plan / land disturbance	Chesterfield County	No public record of filing
Radioactive materials license	Virginia Department of Health, Office of Radiological Health (NRC Agreement State)	Required; no application publicly announced[22]
Air permit (backup generation)	Virginia DEQ	Likely required for emergency generators; no filing found*
Stormwater / VPDES	Virginia DEQ	Potentially required by site design; no filing found*
Authority to construct/operate (Va. Code § 56-580 D)	Virginia State Corporation Commission	Required for a merchant generator; no docket found
Generation interconnection	PJM Interconnection	Application submitted April 2026; validation phase (Section 4)
Federal framework	U.S. Nuclear Regulatory Commission	Part 30 byproduct-materials framework; proposed rule published February 26, 2026, comment period closed May 27, 2026; rule not final[23]

No site work has been reported at Battery Brooke Parkway. On groundbreaking timing the public record holds three formulations, none from a CFS document: a CFS spokesperson’s “late 2020s” in August 2025, trade reporting of 2027–2028 after the Series B2 raise, and American Nuclear Society reporting of 2028.[24]* The honest rendering is late this decade, probably 2028, unconfirmed by the company in writing.

The precedent that matters for the license line above: Massachusetts granted CFS a broad-scope radioactive materials license for SPARC in October 2024, the first of its kind for a commercial fusion machine.[25] Virginia’s version of that proceeding has not publicly begun. A license application that has not been filed cannot be approved on any schedule, and the permit stack is one of the three clocks the risk analysis in Section 6 runs on.

The ARC site’s proximity to Google’s planned data center campus at Bermuda Hundred Road, approximately six miles away, is part of the strategic logic. Minimizing the distance between generation and load reduces transmission losses and simplifies grid interconnection. CFS has indicated the plant will use local non-potable wastewater for cooling, a design choice that avoids competing with

residential and agricultural supplies without eliminating the county’s longer-term industrial water question, which the companion study documents.[17]

Key reference numbers

Metric	Value
Google PPA capacity	200 MW (June 30, 2025)
Eni PPA	>\$1 billion stated value; MW and term undisclosed (September 22, 2025)
Committed offtake	“More than half” of 400 MW (CFS statement)
ARC plant design output	400 MW net
ARC estimated cost	\$2.5 billion (CFS estimate)
Implied capital cost	~\$6,250/kW before financing, operations, decommissioning
CFS total capital raised	>\$3 billion
Site	94 acres, 1201 Battery Brooke Pkwy, Chesterfield County
PJM application	Submitted April 2026; ~400 MW; Cycle 1 of reformed queue
PJM study timeline	1–2 years (PJM); 4–6 years study-to-energization (CFS)
ARC target operation	Early 2030s (contingent; see slip table, Section 5)
SPARC status	~75% complete (CFS program estimate, April–May 2026)
SPARC Q>1 target	2027 (company projection)
NRC framework	Byproduct material, 10 CFR Part 30; rule not final
CERC gas plant	944 MW, approved November 25, 2025; appeal pending, Supreme Court of Virginia
GS-5 rate class	≥25 MW customers; effective January 1, 2027
Dominion data center load projection	13,353 MW by 2038 (2024 IRP)
PJM capacity price, DOM zone, 2025/26	\$444.26/MW-day (1,436% over prior year)
PJM RTO clearing price, 2027/28	\$333.44/MW-day (at FERC-approved cap)
Dominion acquisition	NextEra, \$66.8 billion announced May 18, 2026; approvals pending

Sources: CFS and Eni press materials, PJM releases and auction reports, Virginia SCC orders, Dominion IRP filings, SEC filings. Developer and corporate figures are claims; grid and regulatory figures are from public filings. See endnotes.

SECTION 3: WHY THESE DEALS EXIST

The Google-CFS PPA did not emerge from a corporate sustainability brochure. It emerged from a supply crisis. Virginia's data center industry is consuming electricity at a pace that exceeds the grid's ability to generate and deliver it, and the institutions responsible for managing that grid are struggling to keep up. Every element of this section has moved since the prior version, and all of it has moved in the same direction.

The demand numbers. Dominion Energy's 2024 Integrated Resource Plan projects data center metered load in its Virginia service territory reaching 13,353 MW by 2038, roughly three and a half times current levels, with 5.5 percent annual peak demand growth through 2039.[26] The 2025 IRP Update, filed October 15, 2025 using the PJM-derived load forecast the SCC directed Dominion to adopt, projects energy use roughly doubling by 2045 and calls for about 33 gigawatts of new generation over twenty years: 53 percent solar, 25 percent natural gas, 10 percent wind, 6 percent battery storage, and 6 percent small modular reactors.[27] Dominion's own filing concludes that the portfolio retiring all gas by 2045, as the Virginia Clean Economy Act requires, is not viable on reliability and cost grounds. [27] The SCC has issued no order on the update as of this writing. Its posture on the underlying 2024 IRP, in a July 15, 2025 final order, was to find the plan "legally sufficient" while pointedly declining to bless the magnitude or specifics of the spending it implies.[28] PJM's January 2026 long-term forecast trimmed near-term peaks after stricter vetting of data center requests but kept the long arc steep: summer peak rising from about 160 GW in 2025 to roughly 253 GW by 2046, driven primarily by data centers.[29]

The capacity market signal. The July 2024 PJM auction for the 2025-26 delivery year cleared the Dominion zone at \$444.26 per megawatt-day, a 1,436 percent increase over the prior year, and PJM's independent market monitor attributed \$9.3 billion, or 63 percent, of the total cost increase to data center load.[30] The two auctions since have both cleared at the FERC-approved price cap negotiated in the settlement of Pennsylvania Governor Josh Shapiro's complaint against PJM: \$329.17/MW-day RTO-wide for 2026/27, and \$333.44 for 2027/28, the latter procuring 134,479 MW at a total capacity cost of roughly \$16.4 billion.[31] Two consecutive auctions pinned at an administrative ceiling stopped functioning as price discovery some time ago: demand growth has outrun the supply response, and the cap is absorbing the difference. FERC extended the collar to the next two auctions in April 2026.[32] Those costs flow through to ratepayers. The November 2025 biennial review order produced an \$11.24 monthly bill increase for a typical Dominion residential customer in 2026, with another \$2.36 in 2027.[33]

The generation shortfall and the fossil bridge. On November 25, 2025, the SCC approved the Chesterfield Energy Reliability Center, a 944 MW gas-fired peaker on the retired coal station site a few miles downriver from the fusion parcel, resting on a finding that the grid faces reliability shortfalls during extreme weather as early as 2029.[34] The order is now under appeal. The Southern Environmental Law Center, after losing a reconsideration petition at the SCC in February 2026, filed with the Supreme Court of Virginia on May 27, 2026 on behalf of the Chesterfield NAACP, Appalachian Voices, and Mothers Out Front, arguing among other things that the approval failed the Virginia Environmental Justice Act; a parallel challenge to the DEQ air permit is pending in Richmond Circuit Court.[35] The full docket history is in the companion county study.[17] What belongs in this report is the juxtaposition: on the same county ledger, the fossil bridge is being litigated while the fusion bet is being permitted. The CERC plant exists because the clean alternatives are not yet available; the fusion plant's commercial relevance exists for the same reason. June 1, 2029 is the CERC in-service target. The early 2030s is the fusion target. The gap between those dates is the period in which Chesterfield County hosts new fossil combustion justified, in part, by load from the same hyperscaler that is buying the fusion plant's output.

The rate structure. The same November 25, 2025 order created the GS-5 rate class for customers demanding 25 MW or more, effective January 1, 2027, with minimum demand charges of 85 percent of contracted transmission and distribution capacity and 60 percent of generation.[36] Press accounts of the order add a 14-year contract term with ramp provisions and collateral requirements.[37]* The 2026 General Assembly then layered legislation on top: the Lucas-LeVere Bolling cost-shift package, amended by Governor Spanberger in April and signed in May 2026, directs the SCC to assign data-center-driven costs to the customers driving them, after the Governor struck a provision that would have required data centers to bear PJM capacity purchase costs directly.[38] The statewide fiscal analysis is in the companion state report; the point here is that the regulatory environment the PPAs will operate in is being rebuilt in real time, around the same load growth that produced them.

The carbon constraint. Google has committed to operating on 24/7 carbon-free energy, and a senior Google executive reaffirmed in May 2026 that the 2030 goal stands.[39] The qualifier "24/7" is what separates this commitment from a standard renewable energy credit strategy. Solar generates during daylight. Wind depends on conditions. Both require massive storage to approximate firm delivery. The Joint Legislative Audit and Review Commission found that meeting Virginia's data center demand with solar alone would require doubling the record 2024 installation pace.[40] Small modular reactors at North Anna face regulatory timelines and cost

uncertainties that may push deployment well into the 2030s.[41] Fusion, if it works, is the only technology that is simultaneously firm, carbon-free, and scalable to the load levels data centers require. The PPAs are commercial bets on that conditional.

The budget backdrop. The General Assembly's dispute over the data center sales tax exemption, unresolved as of this writing twelve days into June with a July 1 shutdown threshold approaching, is documented in the companion state report and tracked in the county study.[17][42] It matters here only as weather: the political environment in which the SCC will eventually decide how to treat operator-anchored generation is one in which data center energy costs have become the most litigated question in Virginia politics.

SECTION 4: THE REGULATORY PATHWAY

Four regulatory frameworks now intersect at the Fall Line site: the federal Nuclear Regulatory Commission’s licensing authority, the Virginia State Corporation Commission’s jurisdiction over grid-connected generation, the local zoning process, and, since April 2026, PJM’s interconnection queue. The institutional behavior framework in the Sloan study should attend to what is distinctive about all four: each is processing a fusion plant for the first time, which means the approval pathways are being invented around the applicant.

The NRC framework. In April 2023, the NRC decided that commercial fusion devices would be regulated under the existing byproduct-materials framework, 10 CFR Part 30, rather than the utilization-facility framework that governs fission reactors.[23] The distinction rests on the physics. Fusion reactions are not self-sustaining; there is no chain reaction to run away, and no long-lived spent fuel requiring geological disposal. Congress codified the decision in the ADVANCE Act in July 2024.[43] The implementing rulemaking is now well advanced: the proposed rule, “Regulatory Framework for Fusion Machines,” was published in the Federal Register on February 26, 2026, and its comment period closed May 27, 2026.[23] A licensing framework closer to that of particle accelerators and medical isotope facilities than to nuclear power plants is a substantial regulatory subsidy in time and cost, though the ARC plant will be the first full-scale commercial test of whether the streamlining holds at 400 MW. The rule is not final, and Section 6 treats that as live federal policy risk.

Virginia as an Agreement State. Virginia exercises primary authority over radioactive materials through its cooperative agreement with the NRC, via the Department of Health’s radioactive materials program.[22] CFS confirms ARC will require a Virginia radioactive materials license. The Massachusetts precedent for SPARC, granted October 2024, took the form of a broad-scope license under that state’s Agreement State program.[25] No Virginia application has been publicly announced. This is the least-noticed clock in the project: the state license is a prerequisite to operation, the agency processing it has never licensed a fusion power plant, and the proceeding has not started in public view.

The SCC and grid connection. The ARC plant is an independent generating facility connecting to the Dominion grid through a switchyard on Dominion-managed property, its output entering the PJM wholesale market through Dominion’s transmission. A merchant generator in Virginia requires SCC authority under Va. Code § 56-580 D; no CFS docket appears in the public record as of the evidence date. The unanswered planning question from v1.7 stands unchanged, and it has acquired a second offtaker since: how does the SCC treat PPA-sourced generation

for grid planning? Does the 200 MW Google contracts for reduce the data center load Dominion must plan for in its IRP, or is it supplemental capacity that offsets nothing? If the PPA reduces planned load, it may reduce the infrastructure costs that flow to residential bills. If the SCC treats it as irrelevant to planning, ratepayers see no benefit from the private investment. The SCC has issued no ruling, and its generic proceeding on large-load interconnection has so far produced technical conferences, not orders.[44]

Local zoning. The Chesterfield Board of Supervisors granted the conditional use permit unanimously on September 17, 2025, following an equally unanimous Planning Commission endorsement in August; CFS calls it the world’s first CUP for a commercial fusion power plant.[21] No significant local opposition has been documented. The contrast with the county’s data center politics, where the same board now faces vested-rights litigation over its new CUP ordinance, is documented in the companion study.[17] A 400 MW fusion plant on a former industrial parcel adjacent to a Dominion switchyard presents a different profile to residents than a 200-acre data center campus next to an elementary school, and the zoning record reflects that difference.

The PJM application

In the last week of April 2026, CFS submitted a generation interconnection request to PJM for the Fall Line Fusion Power Station, announcing it on April 28: the first request from a grid-scale fusion developer to any major regional transmission organization.[14] PJM’s own release the next day confirmed the milestone from the other side of the counter, noting that its intake included, “for the first time, fusion energy.”[45]

The mechanics matter more than the milestone. The application entered Cycle 1 of PJM’s reformed interconnection process, the first open intake since PJM closed its queue in 2022, in a window that closed April 27, 2026 with 811 projects seeking 220 GW.[45] The queue reform replaced first-come-first-served with first-ready-first-served: applicants must demonstrate site control and post financial commitments up front. CFS’s 400 MW sits in PJM’s “other” resource category, alongside biomass and coal, because fusion does not yet have a category of its own.[46] A year ago, by CFS’s own account, fusion was not in the drop-down menu on the application portal. [47] Project-specific details, including the queue position and the requested in-service date, are confidential until PJM accepts the application; as of the evidence date the project is in the validation phase.[45] PJM expects cycle studies to take one to two years. CFS’s own framing of the full runway is longer: four to six years from the start of the study process to electricity generation.[14]

Two institutional details deserve flagging. First, Dominion Energy advised CFS on the PJM process under their joint development agreement, which places the incumbent utility in the position of coaching an independent generator through the queue that the utility's own load growth has congested.[14] Second, PJM is using an AI-enabled review tool called HyperQ, developed by Google's Tapestry unit, to speed Cycle 1 application review.[45] A Google subsidiary is helping PJM process the application backlog that includes the plant whose output Google has contracted to buy. No party has suggested impropriety, and the tool reviews hundreds of applications. The observation belongs in the institutional record anyway: at every layer of this project, the entities inventing the process and the entities subject to it overlap.

The arithmetic of the runway is the report's main new analytical fact, and Section 6 builds on it. Four to six years from study start lands commercial operation between roughly 2030 and 2032 if nothing slips, which means the interconnection clock alone now occupies the entire margin between today and the "early 2030s" target. The physics no longer has the schedule to itself.

SECTION 5: THE TECHNOLOGY COLLATERAL

Every contract in this report is anchored on a machine in Devens, Massachusetts. SPARC is the demonstration tokamak that must produce more energy from fusion than the process consumes, the threshold called $Q>1$, before the ARC plant's financing, construction, and offtake commitments convert from bets into a schedule. Both PPAs say so explicitly.[2][9] SPARC is, in the precise sense of the word, the collateral: the asset whose performance secures everyone else's position. The report tracks its status not out of technological interest but because every milestone and every slip reprices the Google and Eni positions.

Status. CFS reported on April 9, 2026 that SPARC is “about three quarters” complete, and in May that it is “nearly 75%.” The figure is a program tracking estimate blending engineering, procurement, manufacturing, and assembly; it is not a physical construction percentage, and the two statements five weeks apart suggest the number is moving slowly.[48] The verifiable hardware record: the 75-ton cryostat base was installed in March 2025; the first production toroidal field magnet, a 24-ton D-shaped unit, passed a month of performance tests validated by the Department of Energy's independent panel in September 2025, earning CFS an \$8 million milestone payment under DOE's Milestone-Based Fusion Development Program; that magnet was moved to its assembly stand in December 2025; and as of mid-May 2026, two of the eighteen toroidal field magnets were in place.[49] The first 48-ton half of the vacuum vessel arrived in October 2025 and the second in May 2026; outfitting has begun.[50] CEO Bob Mumgaard said at CES in January 2026 that all eighteen magnets should be installed by the end of summer 2026, a statement carried by press but absent from CFS's written materials.[51]* Sixteen magnets in roughly three and a half months is the implied pace; readers can do that arithmetic themselves.

CFS announced at the same CES appearance a collaboration with NVIDIA and Siemens to build a digital twin of SPARC, feeding Siemens design and lifecycle data into NVIDIA's Omniverse simulation libraries, with the stated aim of compressing “years of manual experimentation into weeks of virtual optimization.”[52] Google DeepMind had announced its own AI partnership with CFS in October 2025, applying its TORAX plasma simulator to SPARC operations planning.[53] The pattern is consistent with everything else in this report: the technology bet is being de-risked with the tools, and the balance sheets, of the companies that are also its customers and investors.

The target. CFS's own published position, on its technology page and in a May 2026 blog post, is that SPARC operations begin in 2027 and that $Q>1$ comes the same year.[54] That is the company's projection, and this report characterizes it as such.

No month or quarter has been published, and no separate interval between first plasma and Q>1 has been stated.

The record of the dates. The discipline this report applies to every CFS date follows from the table below, which assembles the company's public schedule statements over time. The reader should know that the current target is not the original one, and should also know that the slippage has been absorbed quietly, in changed language across documents rather than in any announcement of delay.

Statement date	SPARC commitment	ARC commitment	Source type
September-December 2021	Net energy from fusion "by 2025"	First plant "completed" early 2030s	CFS press releases
February 2023	"Operational in 2025," net energy "soon thereafter"	Grid power early 2030s	CFS press release
July 2023	First plasma late 2025; Q>1 "by early 2026 at the latest"	—	IEEE Spectrum paraphrase*
December 2024	First plasma 2026, net energy "shortly after"; website begins stating Q>1 "in 2027"	Power to grid early 2030s	CFS press release; cfs.energy
June 30, 2025 (Google PPA)	PPA "anchored in" Q>1; no date in release	Early 2030s	CFS press release
September 22, 2025 (Eni PPA)	CEO: "on track" to turn SPARC on "later in 2026"	Early 2030s	Press-carried CEO statement*
January 2026 (CES)	Turn-on moved to 2027; magnets complete by end of summer 2026	Early 2030s	Press-carried CEO statements*
April-May 2026	~75% complete; "operations begin in 2027"	"Early 2030s schedule for commercial operation"	CFS blog

Three observations. The Q>1 date has moved roughly two years since 2021, from "by 2025" to 2027, without a single announcement of delay. The turn-on date moved from "later in 2026" to 2027 somewhere between September 2025, when the CEO affirmed the earlier date the same day the Eni deal was announced, and the following January. And "early 2030s" has been the ARC formula continuously since December 2021 while its meaning shifted from "completed" to "delivering power" to "commercial operation." A phrase that absorbs five years of upstream slippage without changing is doing a different job than a date. None of this is evidence the machine will fail; tokamaks are hard, and a two-year slip on a first-of-kind device is

unremarkable by the standards of large-scale physics projects. It is evidence about how the company communicates schedule, and it instructs the reader on how much weight “2027” and “early 2030s” should bear now. In June 2026 CFS published five peer-reviewed papers on ARC physics, with the CEO saying they “increase our confidence” in the early-2030s path.[55] Confidence statements are not schedule statements, and the report treats them accordingly.

SECTION 6: RISK ALLOCATION

The PPAs create a risk allocation structure fundamentally different from the traditional utility model. Understanding who bears what risk, and under what conditions, is essential to evaluating whether operator-anchored generation protects or exposes the public. The structure of this section follows the utility finance framework of the Sloan study, and its central update from v1.7 is this: the delivery date now runs on three independent clocks, and slip risk is no longer a single-variable problem.

The three clocks. The physics clock runs through Devens: Q>1 in 2027 by the company's current projection, with the slip history documented above. The permit clock runs through Richmond and Rockville: a state radioactive materials license not yet applied for in public view, an SCC authorization with no docket, DEQ permits with no filings found, and a federal rule not yet final. The queue clock runs through Valley Forge: a one-to-two-year PJM study process that began in April 2026, inside a four-to-six-year study-to-energization runway by CFS's own description. Any one of the three can move the delivery date by itself; none can advance it. The early-2030s target turns on whichever clock runs longest. The new fact in v2.0 is that the queue clock now sets the floor. Even perfect physics in 2027 cannot put ARC electrons on the grid before the interconnection process completes, which on CFS's own numbers lands between 2030 and 2032. The physics determines whether the date holds. The queue determines what the earliest possible date is. The permits are the clock nobody is watching, which is usually the one that bites.

Technology risk. Everything still depends on SPARC. If the demonstration underperforms, slips, or fails to validate the physics at projected scale, ARC's construction schedule shifts, and Google's 200 MW and Eni's undisclosed tranche remain undelivered for the duration. The technology risk is concentrated on CFS and its investors. The grid-level consequences of failure are shared with every ratepayer in the Dominion service territory, because during any delay Google's Chesterfield campuses draw from the grid that the CERC plant and the capacity auctions are pricing.

Project finance risk. CFS has raised more than \$3 billion against an estimated \$2.5 billion project cost, and the offtake book now carries two creditworthy counterparties instead of one. That is a materially stronger financing position than v1.7 described, and it is the Eni deal's main function in the capital structure: a second investment-grade revenue commitment makes the project's debt story less dependent on a single buyer's terms. First-of-a-kind cost overrun risk is unchanged and remains where it was: on CFS equity. Not on Google or Eni, whose PPAs are understood to be fixed-price commitments (inferred from standard structures; terms

undisclosed).[56] Not on ratepayers, because the plant is not rate-based. Not on Chesterfield County, where the disclosed public money is two matching \$1 million siting investments from the Virginia Clean Energy Innovation Bank and the county. [57]

Offtaker pricing risk, and what the two contracts reveal. Neither PPA's price is public, so the comparison the two-offtaker structure invites must be made structurally rather than numerically. Google is buying a hedge against its own load in its own backyard, denominated in its 24/7 carbon-free commitment; the option value of fleet offtake rights and the strategic value of standing up a new firm-power industry plausibly justify a price premium no pure power buyer would pay. Eni is buying a resale position in a market it knows, through a company it has part-owned for eight years; its willingness to put a ten-figure number on the contract is the closest thing the public record holds to an arm's-length price discovery event for unbuilt fusion capacity. The asymmetry of disclosure is itself informative: the deal whose value was announced is the one held by the party that resells power for a living. What neither contract reveals is who absorbs slip. Whether either offtaker holds delay penalties, price adjustments, or walk-away rights tied to SPARC milestones or delivery dates is undisclosed, and the Helion-Microsoft PPA, which reportedly carries financial penalties for missed delivery, demonstrates that fusion offtakers can and do negotiate such terms.[58]* The FOIA and primary-source targets in Section 9 rank the PPA terms accordingly.

Ratepayer risk. The ARC plant remains absent from every Dominion cost recovery proceeding, which keeps the construction-cost firewall between the project and residential bills intact. The temporal mismatch documented in v1.7 is unchanged and is now better quantified: the PPAs were signed in 2025; the plant delivers in the early 2030s at the earliest; and in between, Google's Chesterfield campuses ramp on grid power priced by capacity auctions that have cleared at their administrative cap twice in a row. Ratepayers fund the bridge years through the \$11.24 monthly increase already ordered and whatever the 2028/29 and 2029/30 auctions, both running under the extended FERC collar, add to the stack. The PPA is a claim on future capacity, not present capacity. Nothing about the second offtaker changes that.

Grid reliability risk. Even at full 400 MW delivery, the plant covers a fraction of the load it is associated with. Google's Chesterfield campuses alone are projected to draw more than 1,000 MW at full buildout (author estimate; methodology in the companion county study).[17][59] The remainder comes from the grid under GS-5 terms. The PPA reduces Google's grid dependence for a portion of its load; the grid must still be built and maintained for the rest.

Counterparty and corporate risk. This category is new to v2.0, and it arrived from an unexpected direction. On May 18, 2026, NextEra Energy and Dominion Energy announced a merger agreement, an all-stock transaction valuing Dominion at approximately \$66.8 billion, expected to close in mid-to-late 2027 pending approvals from shareholders, FERC, the NRC, and the Virginia State Corporation Commission. [60] Dominion is not a party to either PPA, but it is the ARC project's landlord, its joint development partner, its interconnection host, and its adviser in the PJM queue. Every one of those relationships will be inherited by a new owner whose integration priorities are unknown, and the SCC review of the merger will run concurrently with the years in which CFS needs its lease executed, its switchyard built, and its state approvals granted. No public statement from either company addresses the fusion project's place in the transaction. Nothing suggests the merger is hostile to the project. The exposure is quieter: the project's most important non-contractual relationships now run through an institution in the middle of changing hands.

Environmental justice dimensions. The CFS plant produces zero operational carbon emissions if it works as designed. The 944 MW CERC gas plant was approved partly because clean alternatives, fusion included, are not yet available. Dominion's own environmental justice screening for the CERC air permit found the host census block group is 84 percent people of color and 73 percent low-income, with 22 of 24 surrounding block groups containing potential environmental justice communities under the Virginia Environmental Justice Act.[61] That record, and the litigation it feeds, belongs to the companion county study;[17] what belongs here is the structural question the distributional framework of the Sloan study should carry forward. The communities adjacent to the CERC site bear the health and environmental cost of the bridge years. The communities that capture the benefits of the data center campuses, and eventually of the fusion plant's tax base, are different communities. The costs and benefits land in different places, on different populations, on different timelines, and the fusion plant's eventual cleanliness does not retroactively compensate the people who breathed the interim.

Reputational and political risk. Fusion has been thirty years away for seventy years, as the joke goes, and the joke carries weight in policy circles. The political environment has sharpened since v1.7: the cost-shift legislation is signed, the budget fight over the data center exemption is unresolved, and the gubernatorial administration ran on making data centers pay their fair share.[38][42] If SPARC slips visibly past the company's 2027 projection while residential bills absorb consecutive capacity auctions at the cap, the fusion plant risks becoming the symbol of a procurement model that privatized the upside of clean firm power while the public funded the bridge. CFS and Google have made commitments that elected

officials will hold them to, on a timeline that extends across at least two more electoral cycles.

Decommissioning risk. Unchanged from v1.7, and still a gap: no public document discloses a decommissioning plan, cost estimate, or financial assurance mechanism for the ARC plant, and the byproduct-materials framework does not impose the decommissioning fund requirements that apply to fission reactors. The proposed NRC rule was open for comment through May 2026; whether the final rule addresses financial assurance for fusion facilities is one of the specific things to read it for.[23]

Federal policy risk. The regulatory pathway in Section 4 rests on a rule that is not final. A change of direction in the rulemaking, congressional intervention, or post-construction imposition of additional requirements would move both schedule and cost. The ADVANCE Act codification narrows this risk but does not close it; statutes fix frameworks, not license conditions.[43]

SECTION 7: THE PRECEDENT QUESTION

If the Google-CFS model works, it becomes the template. The structure, a hyperscale operator contracting directly with an independent generator for firm carbon-free power, was already propagating across the industry before the ARC plant produced a single electron, and the year since v1.7 has only thickened the file. Microsoft's Constellation deal restarts Three Mile Island Unit 1. Amazon's Talen arrangement puts data center load behind the meter at Susquehanna. Google's own book now runs from the CFS PPA through a 25-year contract on the restarted Duane Arnold nuclear plant, the Kairos Power SMR master agreement, the acquisition of developer Intersect Power, and a 20-year Michigan contract obliging it to fund new clean generation for a gigawatt-scale campus.[62] The fleet logic is explicit: the CFS agreement's options on future ARC plants signal a procurement strategy, not an experiment.[6]

Each deal shares a common structural logic. The operator contracts for power outside the regulated utility framework, absorbs some development risk through its purchase commitment, and shifts the generation decision from the utility and its regulator to the operator and its chosen developer. The traditional model in Virginia works differently: Dominion builds or contracts, the SCC approves, the investment is rate-based, costs are recovered from all ratepayers. If operators self-supply at scale, the traditional model is not eliminated but hollowed out, with the utility becoming a transmission and distribution company for the self-supplied load while residential and small-commercial customers remain fully dependent on the regulated system. The fiscal mechanics are unchanged from v1.7: a campus that self-supplies 200 MW of a 1,000 MW load still requires grid infrastructure sized for the full load, GS-5 covers 85 percent of contracted T&D capacity for the contract term, and the Piedmont Environmental Council's advocacy analysis estimates roughly 61 percent of remaining infrastructure costs shift back to residential ratepayers after the term expires.[63] Self-supply changes where some megawatts come from. It does not change who underwrites the wires.

The fusion field, priced. The competitive landscape since March 2026 matters to this report only insofar as it prices the CFS bet, and one paragraph covers it. Helion, holder of the only other major fusion offtake (Microsoft, ~50 MW, with reported delivery penalties), raised \$465 million at a \$15.5 billion valuation in June 2026 to finish its Orion plant, which broke ground in Washington State in July 2025 against a 2028 delivery promise.[58] *TAE Technologies agreed in December 2025 to a merger with Trump Media that would make it one of the first publicly traded fusion companies.*[64] Type One Energy and TVA filed Tennessee's first fusion license application in January 2026 for a 350 MWe stellarator pilot at Bull Run, a

fact with direct relevance to the Sloan study's Tennessee leg.[65] Pacific Fusion cleared its second technical milestone tranche in June 2026.[66] The Department of Energy stood up a dedicated Office of Fusion in its November 2025 reorganization, and its milestone program paid CFS the largest award to date for the validated magnet test.[67] The field's direction is uniform: capital and offtake keep arriving, regulatory firsts keep accumulating, and no commercial machine has yet produced net energy. CFS's PJM application is best read in this context, as a first-mover claim on the one queue position that matters in the data center capital of the world.

Georgia and Tennessee, the other two Sloan study states, face the same demand pressures through different institutional structures: Georgia through a regulated utility whose commission approved roughly 10,000 MW of new capacity in December 2025 with most of it driven by data center demand, Tennessee through a federal power agency now hosting a fusion pilot of its own.[65][68] Virginia's distinctive contribution remains the operator-anchored generation model. If the Fall Line plant delivers, it provides the template operators elsewhere will replicate. If it is delayed or fails, the grid will have been built anyway, the bridge generation will have run anyway, and the question of who pays will have been answered in the interim by default: ratepayers first, with the accounting argument to follow. This report is designed to be useful either way.

SECTION 8: WHAT IS NOT KNOWN

This section exists because the sourcing discipline in these reports requires flagging the boundaries of the public record, not papering over them. Several material questions about the Google-CFS and Eni-CFS arrangements cannot be answered from publicly available documents, and researchers relying on this case study should understand where the evidentiary foundation ends. The list has changed shape since v1.7: one unknown has partially resolved (the second offtaker), and two new ones have arrived (the queue position and the merger).

The prices. Neither PPA's price terms have been disclosed: no per-megawatt-hour price, no escalation formula, no floor or ceiling, for either contract. Without prices, Google's effective cost of fusion power cannot be benchmarked against Dominion generation, PJM wholesale, or alternative clean procurement, and the Eni contract's ten-figure headline cannot be decomposed into volume and tenor. The prices will matter enormously if the fleet model materializes, because subsequent PPAs will benchmark against the first two.

The slip terms. Whether either offtaker holds delay penalties, milestone-linked price adjustments, or termination rights tied to SPARC performance or delivery dates is undisclosed. This is now the single most analytically important gap in the record, because the three-clock structure of Section 6 makes some slippage scenario the base case, and the contracts' treatment of it determines who actually bears that risk.

The Eni volume. The megawatt quantity and term behind the ">\$1 billion" figure are undisclosed. The only public constraint is that Google's 200 MW plus Eni's share exceed half of 400 MW. Whether a residual tranche remains unsold, and who is negotiating for it, is unknown.

The queue position. The PJM application's queue identifier, requested in-service date, and study assumptions are confidential until PJM accepts the application. The report can therefore bound the interconnection timeline only by PJM's generic one-to-two-year study estimate and CFS's four-to-six-year runway statement.

The GS-5 interaction. Unchanged from v1.7, and still unanswered: whether the 200 MW Google procures through the PPA reduces Google's contracted demand under GS-5, or whether Google pays Dominion for full contracted T&D capacity regardless of self-supplied generation. The answer determines how much grid infrastructure cost Google absorbs versus how much flows to other ratepayers.

The SCC treatment. The SCC has issued no ruling on how PPA-sourced generation from an independent fusion facility is treated for IRP, capacity planning, or rate

purposes, and no CFS docket exists in which it could. Until that framework exists, the regulatory treatment of the arrangement is uncertain.

The merger's effect on the project agreements. Whether the CFS lease option, the joint development agreement, and the interconnection arrangements carry change-of-control provisions, and how NextEra intends to treat the fusion collaboration, is not addressed in any merger document or statement located by this report.[60]

The all-in cost of ARC power. CFS's \$2.5 billion estimate implies roughly \$6,250 per kilowatt before financing, operations, fuel, and decommissioning.[69] Whether ARC's levelized cost will be competitive with anything cannot be determined until a plant exists. Researchers should be cautious about cost projections from any source, including CFS, until a first commercial facility has an operating record.

The state's role in project economics. The disclosed public money remains small: \$1 million from the Virginia Clean Energy Innovation Bank matched by \$1 million from Chesterfield County for siting, and a \$500,000 VCEIB grant to VCU for fusion supply chain research.[57][70] Whether additional state or local incentives have been offered, and on what terms, is not in the public record this report has identified.

The workforce picture. CFS has indicated approximately 150 full-time operational jobs at the plant.[71] Construction employment, local hiring shares, and the durability of the supply chain commitments are undisclosed. For scale, JLAR found a typical 250,000-square-foot data center employs about 50 full-time workers.[72]

SECTION 9: GAPS, FOIA TARGETS, AND PRIMARY-SOURCE PRIORITIES

This report is built on press releases, regulatory filings, and trade coverage. The next tier of evidence requires requests. The list below is ordered by analytical value to the questions this case study frames, and is offered to the Sloan research team as a pre-field dossier.

- 1. The PJM application materials.** The generation interconnection request becomes progressively less confidential as it advances; once accepted, queue data (position, requested in-service date, capacity, fuel class) appear in PJM's public queue. Track PJM's New Services Queue for the Fall Line entry; request the feasibility and system impact studies when they exist. The requested in-service date is the single most informative undisclosed number in the project, because it is the date CFS told the grid operator, under financial commitment, rather than the date it told the press.
- 2. The conditional use permit file.** Chesterfield County FOIA: the full CUP application, staff report, proffered conditions, and any correspondence between CFS, Dominion, and county staff. The county study carries the land-use analysis; [17] this report's interest is the conditions that touch operations: water sourcing commitments, decommissioning or restoration obligations, noise and traffic conditions binding the plant's operating envelope.
- 3. State permit applications, as filed.** Virginia Department of Health radioactive materials program: any CFS application, pre-application correspondence, or licensing guidance for the Fall Line plant (the agency has never licensed a fusion power station; its internal preparation materials may themselves be FOIAble). Virginia DEQ: air and stormwater filings when they appear. SCC: any § 56-580 D application. Each filing date is a data point for the permit clock.
- 4. The NRC rulemaking record.** The public comment file on the proposed fusion rule (closed May 27, 2026) will show what CFS, the Fusion Industry Association, and the utilities asked for, including on decommissioning financial assurance, the report's flagged gap. Public record; no FOIA needed.
- 5. Disclosed PPA terms.** Alphabet's SEC filings (10-K commitments notes), Eni's annual report and Italian-market disclosures, and any CFS bond or private placement documents that surface. Eni, as a listed company that announced a value figure, is the likelier disclosure vector; its filings should be checked each cycle for any quantification of the offtake commitment.
- 6. The Dominion agreements.** The land lease or lease option and the joint development agreement. Private contracts, but the merger creates a new

disclosure vector: material contracts and change-of-control terms may surface in NextEra-Dominion merger proxy materials and SCC merger-review filings. The SCC docket on the merger, when opened, should be monitored for any reference to the CFS arrangements.

7. **The SPARC schedule record, maintained.** The slip table in Section 5 should be extended each time CFS publishes a date. The table's value compounds: it is the project's only public schedule-reliability dataset, and by 2027 it will either validate the company's current projection or price the next one.
8. **VDH Fusion Program engagement materials.** The stakeholder engagement records for the Chesterfield site (Virginia FOIA) would show what the Commonwealth is telling residents about fusion safety and what residents are asking, a primary source for the institutional behavior analysis no press release will supply.

CROSS-REFERENCE DEBTS (FLAGGED, NOT EDITED)

Recorded here for series maintenance; no companion files were modified by this revision.

Henrico v3.6 and *Hanover v2.0* companion lists cite this report at v1.7. Both owe a version bump to v2.0 at their next revision. - The in-flight *Chesterfield v3.0* cites the CFS/PPA record as of its own June 12, 2026 snapshot; its companion list should cite this report as v2.0, June 2026. - The state report (*What Virginia Is Spending*, v4.0) predates the PJM application, the Fall Line name, and the NextEra-Dominion merger; its energy-supply discussion will need those at v4.1+. - Any companion that repeats v1.7's "the disposition of the non-Google 200 MW is unknown" framing should be checked: the Eni PPA (September 22, 2025) partially supersedes it.

ENDNOTES

Endnotes are numbered by first appearance. An asterisk marks claims resting on secondary sources only, where no primary document was located or reviewed.

[1] The Alfred P. Sloan Foundation study on the energy implications of data center growth in Georgia, Virginia, and Tennessee is led by researchers based at Emory University and the University of Tennessee whose work spans institutional behavior, distributional and environmental justice analysis, energy geography and rural political economy, utility finance, and energy, labor, and infrastructure. The project launches in October 2026.

[2] Commonwealth Fusion Systems, “Google and Commonwealth Fusion Systems Sign Strategic Partnership Agreement to Commercialize Fusion Energy,” press release, June 30, 2025; Google, The Keyword (blog), June 30, 2025. Some trade coverage dates the deal “July 2025” from later coverage cycles; the announcement date is June 30, 2025.

[3] CFS characterization. Developer claim.

[4] CFS site materials and Chesterfield County zoning record: ARC at 1201 Battery Brooke Parkway on land owned by Dominion Energy Virginia; grid connection through an overhead line and switchyard interconnecting to Dominion facilities.

[5] The bankability characterization is an author assessment based on standard project finance structures; specific financing terms are undisclosed.

[6] Google, The Keyword (blog), June 30, 2025. The agreement includes options for offtake from future ARC plants.

[7] CFS press release, June 30, 2025: “An investor in CFS since 2021, Google also is deepening its relationship with CFS by increasing its stake in the company. Financial terms weren’t disclosed.”

[8] CFS, “Commonwealth Fusion Systems Raises \$863 Million Series B2 Round,” press release, August 28, 2025. Participants included Google, NVentures (Nvidia), Eni, Gates Frontier, Counterpoint Global, and a consortium of Japanese investors led by Mitsui & Co. and Mitsubishi Corp.* (full investor list partly from press aggregation). v1.7 of this report described the round as announced simultaneously with the June 30 PPA; that was an error, corrected here.

[9] Eni and CFS, “Eni and Commonwealth Fusion Systems Sign \$1 Billion+ Power Purchase Agreement, Expanding Strategic Partnership to Commercialize Fusion Energy,” joint press release, September 22, 2025. The “>\$1 billion” figure is company-stated, in the release headline and first sentence; the same release states financial terms were not disclosed. Eni’s investment in CFS dates to 2018; the technological Collaboration Framework Agreement to 2023.

[10] Rick Needham (CFS Chief Commercial Officer), “Fusion forward: CFS signs second power plant customer in 3 months,” The Tokamak Times (CFS blog), September 22, 2025: the two deals cover “more than half” of the first plant’s 400 MW.

[11] MIT Technology Review, September 22, 2025: on the announcement press call, Eni’s director of technology, research & development and digital said Eni would resell the power as it does its other U.S. generation.

[12] CFS, “Commonwealth Fusion Systems Announces Equity Investment by Abu Dhabi-Based Plinth Energy,” press release, June 11, 2026. Amount undisclosed.

[13] CFS corporate boilerplate (“more than \$3 billion,” June 2026); Fusion Industry Association, Global Fusion Industry Report, on CFS’s share of global private fusion investment.

[14] CFS, “Commonwealth Fusion Systems Becomes First Fusion Company to Apply to PJM Interconnection,” press release, April 28, 2026; Ben Byboth, “Going to the grid: CFS applies to plug our first ARC fusion power plant into PJM,” The Tokamak Times (CFS blog), April 28, 2026. The blog states the request was submitted “last week,” i.e., on or before the April 27 window close. The release announces the Fall Line Fusion Power Station name and states the four-to-six-year study-to-energization range. Dominion’s advisory role under the joint development agreement is stated in the release, with a quote from the president of Dominion Energy Virginia.

[15] CFS Chesterfield CUP application and county zoning record; CFS holds an option-to-lease on the Dominion-owned parcel.

[16] December 2024 announcement materials (including the Governor’s office release) describe a 100-acre site; the 2025 county zoning record and Board of Supervisors action describe 94 acres. This report uses the zoning figure.

[17] Tommy N. Turner, *Chesterfield County: The \$0.24 Rate, the Thirty-Year Lock, and the Two-Corridor County*, v3.0, June 2026 (companion report). The county study owns the land-use record, CUP conditions, EDA mechanics, local fiscal terms, corridor politics, and the CERC docket history.

[18] CFS public statements. Developer estimate; actual costs unknowable until construction is complete.

[19] CFS technical specifications. Developer claim; output unconfirmed until operation.

[20] CFS, Chesterfield Site Information page (cfs.energy/chesterfield/info), accessed June 12, 2026: “CFS expects to begin construction after obtaining state, local, and federal permits.”

[21] Chesterfield County Board of Supervisors, September 17, 2025, unanimous CUP approval; Chesterfield County BOS meeting roundup; GreeneHurlocker (CFS land-use counsel), September 23, 2025. Planning Commission unanimous endorsement the week of August 18, 2025. “World’s first Conditional Use Permit for a commercial fusion power plant” is CFS’s characterization (April 28, 2026 release).

[22] Virginia Department of Health, Office of Radiological Health, Radioactive Materials Program (NRC Agreement State); CFS Chesterfield Site Information page: “ARC will require a radioactive materials license from Virginia.” No application publicly announced as of June 12, 2026; checked negative.

[23] U.S. Nuclear Regulatory Commission: Commission vote of April 14, 2023 adopting the byproduct-materials framework (10 CFR Part 30) for fusion energy systems; “Regulatory Framework for Fusion Machines,” proposed rule, 91 Fed. Reg. (February 26, 2026); comment period closed May 27, 2026.* (comment-period dates per American Nuclear Society

reporting of the Federal Register notice). NUREG-1556 Vol. 22 draft guidance accompanies the rulemaking.

[24] Groundbreaking formulations: CFS spokesperson, “late 2020s” (Richmond BizSense, August 21, 2025); 2027–2028 (Engineering News-Record, on the Series B2 raise); 2028 (*American Nuclear Society Nuclear Newswire*, May 1, 2026). No CFS primary document states a groundbreaking year.

[25] CFS, “Commonwealth Fusion Systems Granted Radioactive Materials License for SPARC Fusion Machine,” press release, October 24, 2024 (Massachusetts broad-scope license). The release also states the ADVANCE Act codified the NRC’s fusion framework decision in July 2024.

[26] Dominion Energy Virginia, 2024 Integrated Resource Plan, filed October 15, 2024 (Case No. PUR-2024-00184): data center metered load 13,353 MW by 2038; 5.5 percent annual peak growth through 2039.

[27] Dominion Energy Virginia, 2025 Integrated Resource Plan Update, filed October 15, 2025 (Case No. PUR-2025-00184), using the 2025 PJM Derived Load Forecast at the SCC’s directive: demand roughly doubling by 2045; ~33 GW new generation over 20 years (53% solar, 25% gas, 10% wind, 6% storage, 6% SMR); mandatory full-VCEA-retirement portfolio characterized as not viable. No SCC order on the update as of June 12, 2026; checked negative.

[28] Virginia SCC, Final Order, Case No. PUR-2024-00184, July 15, 2025: 2024 IRP “legally sufficient”; Commission declined to endorse the magnitude or specifics of projected spending and directed methodological changes for the next IRP.* (order characterization partly via Virginia Mercury and Clean Virginia reporting; order date per Dominion’s 2025 IRP Update.)

[29] PJM Interconnection, 2026 Long-Term Load Forecast Report, January 14, 2026: summer peak rising from ~160 GW (2025) to ~253 GW (2046), data centers the primary driver; near-term reductions reflect stricter vetting of data center adjustment requests.

[30] PJM, 2025/2026 Base Residual Auction Report, July 30, 2024: DOM zone \$444.26/MW-day. Prior-year DOM clearing \$28.92/MW-day (Monitoring Analytics, 2025 State of the Market Report for PJM, Table 5-21); the increase is 1,436 percent. The 833 percent figure is the Rest-of-RTO increase, not the Dominion zone’s. Monitoring Analytics attributed \$9.3 billion (63 percent) of the cost increase to data center load.

[31] PJM, 2026/2027 BRA results, July 22, 2025: \$329.17/MW-day RTO-wide, at the cap, 134,311 MW procured. PJM, 2027/2028 BRA results, December 17, 2025: \$333.44/MW-day RTO-wide, at the cap, 134,479 MW procured, ~\$16.4 billion total capacity cost. Clearing prices slightly above the nominal \$325 cap reflect the collar’s annual adjustment mechanics.

[32] FERC accepted PJM’s price collar extension April 28, 2026, applying an adjusted ~\$325/\$175 collar to the 2028/29 BRA (bidding closes July 7, 2026) and 2029/30 BRA (December 15, 2026). The 2028/29 auction had not run as of the evidence date. Original collar: FERC-approved settlement of Pennsylvania Governor Shapiro’s complaint, April 21, 2025.

[33] Virginia SCC, news release and Final Order, Case No. PUR-2025-00058 (Dominion biennial review), November 25, 2025: approved revenue increases of \$565.7M (2026) and

\$209.9M (2027) against \$822M/\$345M requested; typical residential bill +\$11.24/month in 2026, +\$2.36/month in 2027; ROE 9.8 percent.

[34] Virginia SCC, Final Order, Case No. PUR-2025-00037, November 25, 2025: CPCN granted for the Chesterfield Energy Reliability Center, approximately 944 MW nominal, with Rider CERC. Capital cost ~\$1.47 billion; *in-service target June 1, 2029*. (cost and date per Virginia Mercury and WTVR reporting of the order.) Earlier coverage describing the plant as “~1,000 MW” overstates the order’s nominal figure.

[35] SCC, Order on Reconsideration, Case No. PUR-2025-00037, February 12, 2026 (petition denied, suspension lifted; reconsideration had been granted December 16, 2025 on SELC’s December 15 petition for Appalachian Voices, Chesterfield County NAACP, and Mothers Out Front). Southern Environmental Law Center, press release, May 27, 2026: petition for appeal filed with the Supreme Court of Virginia (VEJA, VCEA energy-efficiency, and fuel-cost grounds); petition stage as of June 12, 2026, no briefing schedule. Air permit: DEQ approval December 19, 2025; *SELC appeal in Richmond Circuit Court, February 2026, no ruling found*. Full docket history: companion county study.[17]

[36] Virginia SCC, news release and Final Order, Case No. PUR-2025-00058, November 25, 2025: GS-5 class for customers demanding 25 MW or more, effective January 1, 2027; minimum demand charges of 85 percent (contracted distribution and transmission) and 60 percent (generation), “among other requirements.”

[37] The 14-year contract term, load-ramp provisions (up to 4 years, minimum 20 percent annual ramp), collateral requirements, and ~75 percent load-factor threshold are reported by Virginia Mercury (November 25, 2025) and other coverage of the order.* The SCC’s release states only the 25 MW threshold and the 85/60 minimums; the additional terms should be verified against the final order before being relied on.

[38] Virginia Mercury, April 16 and May 18, 2026; Inside Climate News, May 15, 2026.* The Lucas/LeVere Bolling package directs SCC cost-assignment to high-load users, extends bill assistance, and authorizes distribution undergrounding; the Governor’s April 16 amendments struck the provision requiring data centers to bear PJM capacity purchase costs directly, substituting broader SCC cost-allocation authority. Signed mid-May 2026.

[39] Google 24/7 carbon-free energy commitment, corporate sustainability materials; Bloomberg, May 19, 2026: senior Google executive reaffirming the 2030 goal.*

[40] Joint Legislative Audit and Review Commission, Report 598, “Data Centers in Virginia,” December 9, 2024: meeting unconstrained data center demand would require solar additions at roughly double the record 2024 pace; unconstrained growth could raise Virginia electricity use 183 percent by 2040.

[41] Dominion Energy Virginia, 2024 IRP: SMR deployment in portfolios from the mid-2030s; North Anna SMR feasibility RFP (July 2024); Dominion investment in GE Hitachi BWRX-300 development; Dominion-Amazon SMR exploration MOU (October 16, 2024). No SMR license application filing confirmed as of the evidence date.

[42] Tommy N. Turner, *What Virginia Is Spending, What Virginia Is Getting*, v4.0, March 2026 (companion report); budget status as of June 12, 2026 per the companion county study. [17]

[43] ADVANCE Act, July 2024, codifying the NRC's byproduct-materials decision for fusion (per CFS release of October 24, 2024 and Fusion Industry Association materials).

[44] Virginia SCC, generic proceeding PUR-2024-00144: technical conferences on large-load interconnection (December 2024) and data center load flexibility (December 12, 2025). No order establishing PPA treatment.

[45] PJM Interconnection, "Over 800 New Generation Projects Seek to Connect Under PJM's Reformed Process," news release, April 29, 2026: 811 projects, 220 GW, window closed April 27, 2026; validation phase; one-to-two-year study expectation; project details confidential until acceptance; resource mix including "for the first time, fusion energy"; HyperQ (Google Tapestry) AI-assisted application review.

[46] American Nuclear Society, Nuclear Newswire, May 1, 2026: CFS's ~400 MW classed in PJM's "other" category (biomass, coal, methane, fusion), first commercial fusion interconnection request to a major grid.

[47] CFS blog, April 28, 2026: "A year ago, fusion energy wasn't in the drop-down menu on the application website. But now it is."

[48] CFS blog, April 9, 2026 ("about three quarters" complete; tracking estimate combining engineering, procurement, manufacturing, assembly) and May 14, 2026 ("nearly 75%"). The figure is a program estimate, not physical construction percentage.

[49] Cryostat base installed March 2025 (CFS blog, March 25, 2025). First production toroidal field magnet: performance tests validated by DOE's independent expert panel, \$8 million milestone payment, the program's largest to date (CFS press release, September 30, 2025); magnet moved to assembly stand December 2025 (CFS blog, January 6, 2026). Two of 18 TF magnets in place as of May 14, 2026 (CFS blog). Press headlines describing the first magnet as "installed" upgrade CFS's own "delivered" language.

[50] Vacuum vessel: two 48-metric-ton halves, 96 tons total; first half arrived October 28, 2025, second announced May 14, 2026, outfitting begun (CFS blogs). The "106,000-pound" figure circulating in aggregator coverage is a pound conversion of the 48-ton half and is not CFS language; this report uses CFS's figures.

[51] Bob Mumgaard at CES 2026, per TechCrunch, January 6, 2026: all 18 TF magnets expected installed by end of summer 2026.* The date appears in no CFS written material located by this report.

[52] CFS, "Commonwealth Fusion Systems Accelerates Commercial Fusion with Siemens and NVIDIA," press release, January 6, 2026: SPARC digital twin via Siemens Xcelerator data feeding NVIDIA Omniverse/OpenUSD, unveiled at CES 2026.

[53] Google DeepMind and CFS AI partnership (TORAX plasma simulator; simulation, optimization, and control work for SPARC), announced October 16, 2025 (DeepMind blog; CFS blog; Axios).

[54] CFS technology page (cfs.energy/technology/sparc, accessed June 2026): "In 2027, it'll become the world's first commercially relevant fusion energy machine to produce more energy from fusion than it needs to power the process." CFS blog, May 14, 2026: "When SPARC operations begin in 2027..." Company projection; no month or quarter published.

Archived captures show the “in 2027” language first appeared on the site between November 3 and December 19, 2024.

[55] CFS, press release, June 4, 2026: five peer-reviewed papers on ARC physics; CEO statement that the papers “increase our confidence” in the early-2030s grid path.

[56] Inferred from standard PPA structures; the risk allocation terms of both PPAs are undisclosed.

[57] Office of the Governor of Virginia, press release, December 19, 2024: \$1 million Virginia Clean Energy Innovation Bank investment, matched by \$1 million from Chesterfield County, for initial siting costs.

[58] Helion Energy: \$465 million Series G at \$15.5 billion valuation, June 2026 (TechCrunch, June 4, 2026); *Orion groundbreaking July 30, 2025, Chelan County, Washington, 2028 delivery target (S&P Global, July 30, 2025); the 2023 Microsoft PPA (~50 MW) reportedly carries financial penalties for missed delivery, with Constellation as managing party.* Penalty terms have not been published.

[59] Author estimate, derived from site plans, acreage analysis, and industry benchmarks; Google has not disclosed a total projected load figure. Methodology in the companion county study.[17]

[60] NextEra Energy and Dominion Energy, merger agreement dated May 15, 2026, announced May 18, 2026 (Dominion Energy SEC Form 8-K and joint release): all-stock exchange of 0.8138 NextEra shares per Dominion share plus a one-time aggregate cash payment of approximately \$360 million; transaction value approximately \$66.8 billion (~\$76/share at pre-announcement prices); NextEra holders ~74.5 percent of the combined company; closing expected mid-to-late 2027, subject to shareholder, FERC, NRC, and Virginia SCC approval, among others. No merger document located by this report addresses the CFS arrangements.

[61] Dominion Energy Virginia, “Environmental Justice Desktop Review for the Chesterfield Energy Reliability Center Project,” revised September 23, 2024, Appendix H of the CERC air permit application (Virginia DEQ): Census Tract 1004.03, Block Group 3; 84 percent population of color, 73 percent low-income, 41 percent Hispanic/Latino, 26 percent limited-English households; 22 of 24 block groups within three miles contain potential EJ communities under Va. Code § 2.2-234.

[62] Microsoft-Constellation, Three Mile Island Unit 1 restart PPA, 2024. Amazon-Talen, Susquehanna PPA and co-location, 2024-2025. NextEra-Google, Duane Arnold restart with 25-year PPA, announced October 27, 2025. Google-Kairos Power 500 MW master agreement, October 2024, first deployment via TVA. Google acquisition of Intersect Power, ~\$5 billion, reported January 2026. *Google Michigan ~1 GW campus tied to a 20-year contract funding new clean generation, Bloomberg, March 18, 2026.*

[63] Piedmont Environmental Council, analysis of SCC Case No. PUR-2024-00121, January 7, 2026. Advocacy analysis, not a regulatory finding: ~61 percent of remaining grid infrastructure costs estimated to shift to residential ratepayers after the 14-year contract term.

[64] TAE Technologies-Trump Media merger, announced December 18, 2025, ~\$6 billion all-stock, expected to close mid-2026 (CNBC; TAE release; World Nuclear News).*

[65] Type One Energy and TVA: agreement for the 350 MWe Infinity Two stellarator pilot at Bull Run (September 2025); Tennessee's first fusion license application (state byproduct-materials license), filed January 2026 (Type One releases).

[66] Pacific Fusion: second technical milestone set completed (440 GW pulser prototype), unlocking a further tranche of its >\$1 billion milestone-based Series A; demonstration-system construction expected to begin summer 2026 (TechCrunch, June 2, 2026; ANS, March 4, 2026).*

[67] DOE Office of Fusion created in the November 20, 2025 departmental reorganization (AIP FYI; Fusion Industry Association). DOE Milestone-Based Fusion Development Program: CFS magnet validation payment, September 30, 2025 (endnote 49).

[68] Georgia Public Service Commission, Order Adopting Stipulation and Granting Certification of Capacity, Docket Nos. 56298 and 56310, December 19, 2025: 9,985 MW approved, ~80 percent driven by data center demand. See the companion Georgia report (v2.1, March 2026) for the fiscal analysis.

[69] $\$2,500,000,000 / 400,000 \text{ kW} = \$6,250/\text{kW}$. Derived from CFS's estimated cost and design capacity; developer figures.

[70] VCU College of Engineering News, February 4, 2026: \$500,000 VCEIB grant for advanced magnetic materials fusion research (AM2P laboratory).

[71] CFS, December 17, 2024 announcement materials; subsequent clarification by a CFS vice president: approximately 150 full-time operational employees. Developer claim.

[72] JLARC, Report 598, December 9, 2024, p. i: a typical 250,000-square-foot data center may employ approximately 50 full-time workers.

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