

Cirrus

Compact Plasma Toroid · Distributed Power + A1 Component

<p>NET POWER</p> <p>2.89 MWe</p>	<p>Σ TOPOLOGY</p> <p>Plasma toroid</p>	<p>AURORA PRICING</p> <p>\$16-26 M</p>	<p>PRIMARY VALUE</p> <p>A1 integration</p>
--	--	--	--

Compact Plasma Toroid with Open Architecture

Multiple pathway options · 2.89 MWe distributed scale · A1 Mode B/C component

A3 Cirrus is Aurora's compact distributed-scale plasma platform with deliberately **open architecture**: A3's working fluid, fuel pathway, and σ mechanism preserve optionality across multiple commercial deployment routes. A3's primary commercial value flows through **integration as a power module in A1 Corona Mode B/C**, where 1x to 9x A3 plasma toroids provide mission-critical electrical power. Standalone deployment as 2.89 MWe distributed clean firm power is available but economically marginal until A1 manufacturing volumes drive A3 cost-down.

WHY A3 CIRRUS

A3 occupies a unique strategic position: simultaneously a standalone distributed-power product AND a critical component of the A1 defense platform. The "open architecture" framing of A3 (multiple pathway options for working fluid, fuel, and σ mechanism) preserves design optionality to align A3 specifications with whichever A1 mode dominates after the 2028 MCIB v9 validation. A3 is the lowest-cost-of-entry into Aurora's portfolio at \$20-26M turnkey, with primary value realization through portfolio integration rather than standalone economics.

A3 Configuration Pathways

<p>PATHWAY 1 · PRIMARY VALUE</p> <p>A1 Component (Mode B/C)</p> <p>\$16M intra-portfolio</p> <p>Integrated as power module in A1 Corona Mode B (1x A3) and Mode C (9x A3 array). Primary commercial value pathway. Defense margins through A1 program (55%).</p>	<p>PATHWAY 2 · DISTRIBUTED</p> <p>Standalone Power Plant</p> <p>\$23M turnkey · 10.4% IRR S1</p> <p>2.89 MWe distributed clean firm power. Microgrid, niche industrial, remote site. Standalone economics marginal until A1 volume cost-down.</p>	<p>PATHWAY 3 · NICHE</p> <p>Specialty Applications</p> <p>Application-specific</p> <p>Defense base resilience · island-mode microgrids · plasma research platforms · specialty fusion-adjacent applications.</p>
---	--	---

OPEN ARCHITECTURE — THE INNOVATION

A3's σ mechanism is **plasma toroid** — a sub-fusion plasma confined in a toroidal geometry, providing high σ and high-temperature transport. Unlike A2's locked SC-NH₃ + dissolved alkali design or A4's locked Cs-vapor electrodes, A3 deliberately preserves optionality:

- ✓ **Multiple working fluid options** — supercritical fluid, atmospheric plasma, or hybrid · selectable based on application
- ✓ **Multiple fuel pathways** — H₂, NH₃, or grid-electric charge depending on deployment site
- ✓ **Multiple σ mechanism options** — plasma toroid (primary), DBD-augmented (A1-aligned), or seeded supercritical (A2-aligned)
- ✓ **Cross-architecture controllers** — FLUID-CTRL family substituted architecture-by-architecture

TARGET APPLICATIONS · TODAY

Primary: A1 Corona Mode B/C component sales (1x or 9x A3 plasma toroids per A1 platform). **Secondary:** distributed clean firm microgrids · defense base resilience · specialty industrial customers · plasma research platforms · fusion-adjacent applications.

Power, Efficiency & Operating Envelope

Net electrical output	2.89 MWe	Standalone distributed scale · sized for microgrid + A1 component integration
Cycle efficiency	~40-50%	Pathway-dependent · plasma toroid sub-fusion regime · open optionality
Operating temperature	~3,000-5,000 K	Plasma toroid plasma temperature · sub-fusion regime · σ -driven ionic conduction
σ mechanism (primary)	Plasma toroid	Sub-fusion plasma σ · toroidal geometry · alternative to seeded combustion
σ target	300-1,000 S/m	Pathway-dependent · plasma toroid (high) vs DBD-augmented (medium)
Capacity factor (standalone)	75-85%	Distributed-scale · maintenance windows · fuel/charging logistics
Grid voltage interconnection	4.16 / 12.47 kV	Distribution class · standard utility primary · or BTM industrial

Open Architecture Configuration Options

A3's open architecture preserves optionality across multiple deployment configurations. Specific pathway selection is made at site engineering based on A1 program alignment, fuel/charging infrastructure, and regulatory context.

CONFIGURATION ELEMENT	OPTIONS PRESERVED	NOTES
Working fluid	SC fluid · atmospheric · hybrid	Supercritical fluid (A2-aligned) · atmospheric plasma (A1-aligned) · or hybrid pathway
Fuel input	H ₂ · NH ₃ · grid-electric	Selectable based on site infrastructure · grid-electric charge enables A4-aligned thermochemical
σ generation	Plasma toroid · DBD · alkali	Plasma toroid is primary · DBD-augmentation aligns with A1 · dissolved alkali aligns with A2
Plasma confinement	Toroidal · linear · helical	Toroidal default for sub-fusion stability · alternative geometries for A1 Mode B/C integration
Magnet system	5-15 T REBCO HTS	Scalable based on pathway selection · shared technology with A1 + A2

Physical Envelope

System dimensions	~3-5 m diameter	Compact toroidal geometry · fits in standard industrial enclosure
Total system mass	~12-18 tonnes	Pathway-dependent · plasma toroid + magnet + power conditioning
Site footprint (standalone)	~0.2 acre	Compact distributed-scale · small industrial site or microgrid integration
A1 component packaging	Modular plug-in	Mode B (1 × A3) and Mode C (9 × A3 array) · standard mechanical/electrical interfaces
Cooling requirements	Air or water-cooled	Pathway-dependent · standalone air-cooled · A1-integrated cooling per platform spec
Construction period	12-15 months	Standalone deployment · faster than A2 (24 mo) · slower than A4 (6 mo)

WHY OPEN ARCHITECTURE

The deliberate optionality in A3's design reflects Aurora's portfolio strategy. A3's primary commercial value flows through A1 program integration, but the dominant A1 mode won't be clear until 2028 MCIB v9 validation. By preserving multiple pathway options (working fluid, fuel, σ mechanism), A3 can be aligned with the dominant A1 mode after 2028 rather than locking in a configuration prematurely. Standalone applications continue to benefit through application-specific tuning.

How It Works

Operating Principle — Plasma Toroid σ Generation

A3's defining innovation is **plasma toroid σ generation** — a sub-fusion plasma confined in a toroidal geometry that delivers $\sigma \geq 300\text{-}1,000$ S/m via direct ionic conduction at temperatures of 3,000-5,000 K. This plasma σ is fundamentally different from A1's HydroSynth DBD, A2's dissolved alkali, and A4's cesium-vapor mechanisms — and is the third heritage sidestep in Aurora's "Four Mechanisms for σ " portfolio thread.

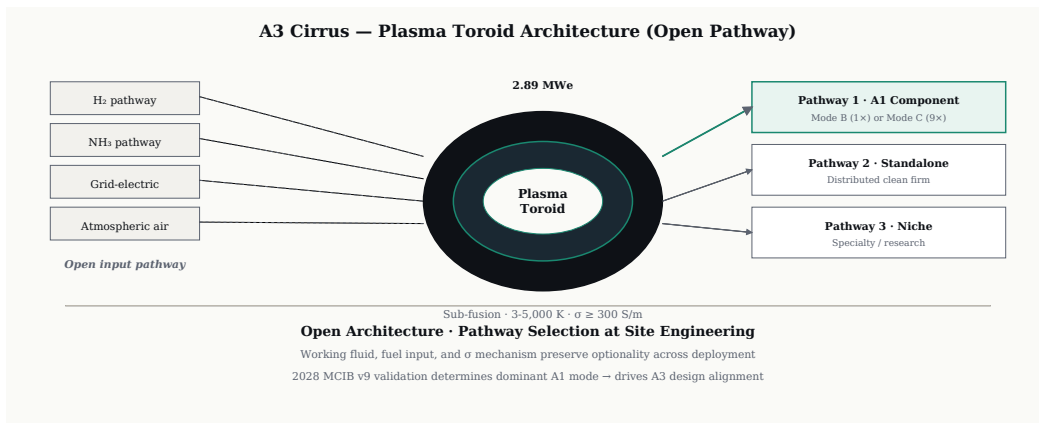


Figure 1 · A3 Cirrus open architecture — multiple input pathways, plasma toroid σ core, three commercial output pathways

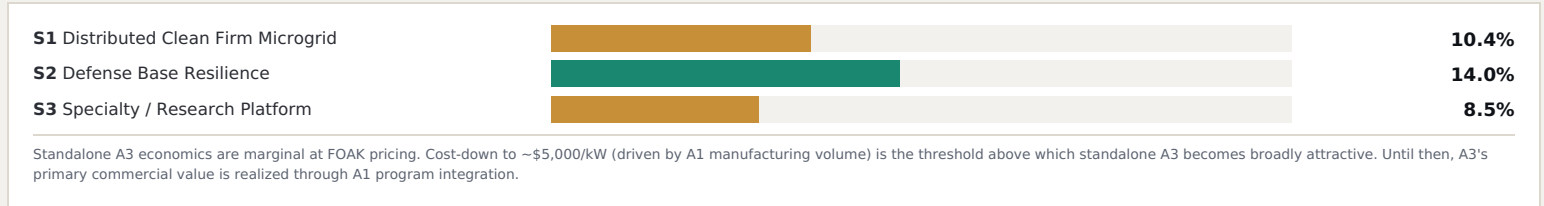
Subsystem Architecture

A3-01 · Plasma Toroid Confinement	Sub-fusion plasma	Toroidal geometry · 5-15 T HTS magnet system · plasma temperature 3,000-5,000 K · primary σ source
A3-02 · Working Fluid (open option)	SC fluid · atmospheric · hybrid	Pathway-selectable based on application
A3-03 · Fuel/Charge Input	H ₂ · NH ₃ · grid-electric	Site-dependent · A1 Mode B/C uses platform fuel · standalone selects per fuel infrastructure
A3-04 · Power Extraction Module	2.89 MWe nominal	Faraday or Hall configuration · standardized electrical interface for A1 integration
A3-05 · Plasma Diagnostic Suite	Cross-platform	Transferable across HydroSynth (A1), SC-NH ₃ (A2), plasma toroid (A3), Cs vapor (A4)
A3-06 · FLUID-CTRL Family	Pathway-substituted	Architecture-by-architecture controller substitution · application-flexible
A3-07 · Aurora NeuroControl	Real-time AI/ML	Plasma toroid stability control · transferred from tokamak fusion · ELM mitigation strategies

Pricing & Project Economics

Aurora turnkey · standalone	\$20-26M (\$23M mid)	2.89 MWe distributed clean firm power · 12-15 month delivery
Aurora pricing · A1 component	\$14-19M (\$16M mid)	Intra-portfolio transfer to A1 program · Mode B (1x) or Mode C (9x) configurations
\$/kW basis (standalone)	~\$8,000/kW	Marginal at FOAK · cost-down expected as A1 volume drives manufacturing scale
LCOE (standalone S1)	~\$185-220/MWh	Distributed-scale clean firm · captures \$45Y PTC · marginal vs grid baseline
Aurora gross margin (standalone)	32%	Commercial distributed · slightly lower than A2/A4 · narrow niche fit constrains pricing
Aurora gross margin (A1 component)	55%	Defense aerospace margin · A3-as-A1-component captures defense procurement margins

STANDALONE DEPLOYMENT IRR (10.4% S1 · MARGINAL)



10-YEAR CUMULATIVE A3 REVENUE BY PORTFOLIO SCENARIO

SCENARIO	A3 STANDALONE	A3-IN-A1	TOTAL A3 REVENUE
S1 Climate (30%)	30 units · \$690M	14 units · \$224M	\$914M
S2 Defense (12%)	10 units · \$230M	51 units · \$816M	\$1,046M
S3 Distributed Boom (28%)	45 units · \$1,035M	8 units · \$128M	\$1,163M
S4 Conservative (25%)	15 units · \$345M	5 units · \$80M	\$425M
S5 Pivot (5%)	8 units · \$184M	0 units · \$0M	\$184M
Probability-weighted	\$258M	\$348M	\$606M

A3 value flows through A1 integration: Probability-weighted A3-in-A1 revenue (\$348M) exceeds A3 standalone revenue (\$258M). In S2 Defense, A3-in-A1 contribution (\$816M) is 3.5x larger than A3 standalone (\$230M). This validates the strategic positioning: A3's primary commercial value flows through A1 program integration rather than direct distributed-power sales.

Why Aurora · Competitive Positioning

vs distributed natural gas (3 MW)	Clean firm · \$45Y eligible	A3 zero direct emissions · qualifies \$45Y PTC · NG cogen does not
vs Li-ion BESS + solar (3 MWe)	True 24/7 firm	A3 dispatchable · vs intermittent + 4-hour storage limited duration
vs microreactor (Westinghouse eVinci)	No nuclear permitting	A3 deploys in 12-15 months · microreactor 5-7+ years through NRC
vs A1 alternative power modules	Aurora-internal alignment	A3 designed as A1-integrated module · platform commonality · cross-architecture controllers

AURORA'S IP & HERITAGE SIDESTEP ADVANTAGES

- ✓ **Plasma toroid σ mechanism** — sub-fusion plasma in toroidal geometry · third heritage sidestep in Aurora's "Four Mechanisms for σ " portfolio
- ✓ **Open architecture optionality** — multiple working fluid / fuel / σ pathways preserved · enables A1 alignment after 2028 MCIB v9
- ✓ **A1 program integration** — Mode B (1x A3) and Mode C (9x A3 array) · 100% platform technology share · primary commercial value channel
- ✓ **Cross-platform plasma diagnostics** — transferable across HydroSynth (A1), SC-NH₃ (A2), plasma toroid (A3), Cs vapor (A4) · platform value beyond A3
- ✓ **Aurora NeuroControl** — plasma toroid stability + ELM mitigation · transferred from tokamak fusion control · 32-month head start

PATH TO COMMERCIAL OPERATION

- **Stage 1 (2026)** — Pre-hardware plasma toroid validation · open architecture pathway selection studies · A1 integration interface definition
- **Stage 2 (2027-2028)** — A3 FOAK build · standalone deployment at industrial host · A1 Mode B integration testing · MCIB v9 retrofit qualification
- **Stage 3 (2029-2031)** — A1 Mode B/C volume integration · standalone cost-down through A1 manufacturing scale · path to ~\$5,000/kW threshold
- **Stage 4 (2032+)** — Mode C 9x A3 array integration · sustained dual-channel commercial operation

Discovery Items Register: A3 has active discovery items covering plasma toroid stability across operating regimes, open-pathway working-fluid compatibility, magnet integration tolerances for A1 Mode B/C packaging, and FLUID-CTRL family controller substitution. All items have explicit Stage 1/2 retire criteria and are tracked in Aurora's portfolio risk register.

NEXT STEP

Contact CDW Research at Drumheller, AB to discuss A3 deployment pathway selection — whether as A1 Mode B/C component, standalone distributed power, or specialty application platform. A3 design alignment with dominant A1 mode is finalized after 2028 MCIB v9 validation; current ~~Stage 1 pre hardware engagement preserves all three pathway options.~~