AURORA ARCHITECTURE · A2

Meridian

50 MWe Multi-Pass Faraday MHD with §45V H_2 Co-Production

NET POWER	CYCLE EFFICIENCY	AURORA TURNKEY	BEST-CASE IRR
50 MWe	**0.50** η	**$62** M	**22.4** %

Utility-Scale Firm Clean Baseload + 45V Hydrogen Co-Product

Supercritical NH_3 + dissolved alkali · Heritage σ-sidestep · Multi-pass Faraday channel

A2 Meridian is Aurora's utility-scale clean firm specialist: a 50 MWe multi-pass Faraday MHD generator using **supercritical NH_3 (18 MPa) with dissolved alkali** as both working fluid and σ source — a chemistry-mediated heritage sidestep that avoids the seeded-combustion plasma failure mode that ended 1989-1993 DOE Faraday MHD programs. AmmoBurst pre-conditioning provides thermal regeneration and a §45V Clean Hydrogen byproduct stream that uplifts buyer project IRR by 1.5-2.6 percentage points.

WHY A2 MERIDIAN

A2 is the only utility-scale clean firm generator that combines (a) zero-emission §45Y eligibility, (b) §45V H_2 byproduct revenue, (c) dramatically lower CAPEX than Allam-Fetvedt or NuScale SMR alternatives at the same scale, and (d) heritage sidestep IP that solves the 1993 DOE Faraday MHD failure modes. For premium clean firm utility buyers, A2 delivers **20.1% project IRR** with 5-year payback on $98M total project CAPEX — clearing utility hurdle rates by 10+ percentage points.

HERITAGE SIDESTEP — THE Σ INNOVATION

Heritage 1989-1993 DOE Faraday MHD programs (U-25, Avco Mark V/VI, CDIF) failed because **alkali-seeded combustion plasma** as a σ source produced slag chemistry attack on electrodes, continuous Cs makeup consumption, and unworkable economics. A2 sidesteps this through:

- ✓ **SC-NH_3 at 18 MPa working fluid** — supercritical ammonia provides clean high-temperature transport without combustion products in the MHD channel
- ✓ **Dissolved alkali σ source** — alkali salts dissolved in the SC fluid generate σ ≥ 500 S/m via chemistry-mediated pathway, NOT seeded combustion plasma
- ✓ **3-pass toroidal channel topology** — multi-stage J×B extraction at lower per-pass field requirements than single-pass heritage designs
- ✓ **AmmoBurst pre-conditioning** — $NH_3 \leftrightarrow N_2 + 3H_2$ catalytic chemistry provides thermal regeneration AND §45V H_2 byproduct revenue

TARGET BUYERS · TODAY

Regulated utilities under CES mandates · Industrial cogen host sites with NH_3 infrastructure · Premium clean firm IPPs with utility PPA · Industrial decarbonization customers (chemical, steel, cement) needing 24/7 clean baseload · Microgrids requiring islanding-capable utility-scale firm power.

Power, Efficiency & Operating Envelope

Net electrical output	50 MWe	Continuous baseload · grid-firm dispatch · already net of AmmoBurst slipstream
Net cycle efficiency (η)	0.50	Electrical out / NH_3 thermal in · target design point
NH_3 feedstock intensity	~387 kg/MWh-e	At η = 0.50 · NH_3 LHV 5.17 kWh/kg · drives fuel cost economics
Operating temperature (peak)	~2,000 K	SC-NH_3 + dissolved alkali peak · MHD channel inlet
Operating pressure	18 MPa	Supercritical ammonia · 4-6× CCGT operating pressure · drives compact channel
σ target (sustained)	500-1,000 S/m	Chemistry-mediated via dissolved alkali · NOT seeded combustion plasma
Capacity factor (typical)	85-90%	Utility-scale baseload · maintenance windows for AmmoBurst catalyst
Grid voltage interconnection	138 / 230 / 345 kV	Transmission-class · system impact study typically required

Working Fluid & σ Mechanism

MHD working fluid	SC-NH_3 + dissolved alkali	Supercritical ammonia at 18 MPa · alkali salts dissolved in fluid
σ generation mechanism	Dissolved alkali in SC fluid	Chemistry-mediated · NOT alkali-seeded combustion plasma · heritage sidestep
Channel topology	3-pass toroidal Faraday	Multi-stage J×B extraction · lower per-pass field requirements
AmmoBurst pre-conditioning	$NH_3 \leftrightarrow N_2 + 3H_2$	MOF-catalyst chemistry · regenerative heat transfer · H_2 slipstream
H_2 byproduct slipstream	~5% of NH_3 feedstock	Sized to ~1,270 t H_2/yr at 85% CF · §45V revenue
HTS magnet system	15 T REBCO conduction-cooled	Modern HTS technology enables compact MHD channel
Combustion in MHD channel?	None	Heritage sidestep · qualifies §45Y without CCUS

Physical Envelope

Site footprint (deployed)	~10 acres	Includes MHD module · NH_3 storage (700 t · 2-day) · cooling · interconnect
MHD module dimensions	~12 m × 4 m × 4 m	Multi-pass Faraday channel + HTS magnet + AmmoBurst integration
NH_3 infrastructure	2-day onsite storage	700-tonne refrigerated tanks · transfer pumps · vapor recovery
Construction period	24 months	Vs Allam-Fetvedt 36-48 mo · vs NuScale SMR 60-84 mo
Cooling requirements	~15,000 gpm	Wet cooling tower or dry-cooled option for water-stressed sites

§45V H_2 BYPRODUCT REVENUE STREAM — ARCHITECTURALLY UNIQUE TO A2

A2's AmmoBurst slipstream produces ~1,270 tonnes/yr of clean H_2 that qualifies for §45V Clean Hydrogen PTC. Tier eligibility depends on upstream NH_3 source carbon intensity:

- **Tier 1** ($3.00/kg) · green NH_3 source · <0.45 kg CO_2e/kg H_2
- **Tier 2** ($1.00/kg) · blue NH_3 source · 0.45-1.5 kg CO_2e/kg H_2
- **Tier 3** ($0.75/kg) · low-CI grey NH_3 · 1.5-2.5 kg CO_2e/kg H_2

At Tier 2 (blue NH_3) baseline: **$1.27M/yr H_2 revenue, +1.5 pts buyer IRR**. At Tier 1 (green NH_3) upgrade: **$3.81M/yr H_2 revenue, +4.5 pts buyer IRR**.

Operating Cycle

A2 operates as a **supercritical-fluid heritage-sidestep generator** with H_2 co-production. NH_3 feedstock undergoes AmmoBurst pre-conditioning ($NH_3 \leftrightarrow N_2 + 3H_2$ catalytic chemistry) for thermal regeneration. The supercritical NH_3 + dissolved alkali working fluid traverses a 3-pass toroidal Faraday channel where $\sigma \geq 500$ S/m is generated chemistry-mediated by dissolved alkali — not by combustion plasma. Multi-pass J×B extraction yields 50 MWe net at $\eta = 0.50$ cycle efficiency. A 5% NH_3 slipstream produces clean H_2 byproduct for §45V revenue.

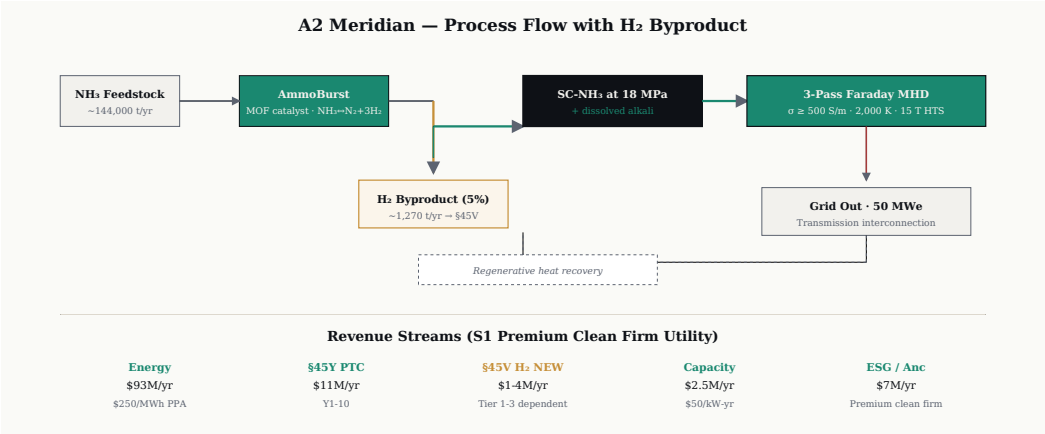


Figure 1 · A2 Meridian process flow showing AmmoBurst pre-conditioning, SC-NH_3 working fluid, and §45V H_2 byproduct slipstream

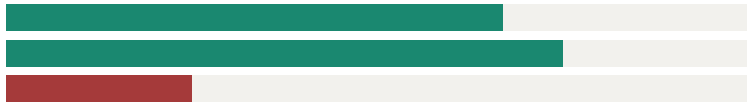
Subsystem Architecture

A2-01 · NH_3 Feedstock System	700 t storage	Refrigerated NH_3 tanks · pipeline or truck delivery · 2-day onsite buffer · vapor recovery
A2-02 · AmmoBurst Pre-Conditioner	MOF-catalyst	$NH_3 \leftrightarrow N_2 + 3H_2$ reversible chemistry · regenerative heat from MHD exhaust · H_2 slipstream sized to byproduct revenue target
A2-03 · SC-NH_3 Conditioning	18 MPa supercritical	Compression to 18 MPa · alkali salt dissolution · heating to ~2,000 K · feeds MHD channel
A2-04 · 3-Pass Faraday Channel	Toroidal topology	Multi-stage J×B extraction · 15 T REBCO HTS magnet · Cs-vapor electrode interfaces · 50 MWe net
A2-05 · H_2 Recovery & Purification	Membrane separation	~1,270 t H_2/yr at 99.97% purity · §45V tier eligibility based on upstream NH_3 CI
A2-06 · Power Conditioning	DC → 138 kV AC	High-voltage transmission interconnect · IEEE 1547 + transmission requirements
A2-07 · Aurora NeuroControl	Real-time AI/ML	Plasma control transferred from tokamak fusion · adaptive σ optimization · grid dispatch

Pricing & Project Economics

Aurora turnkey contract	$55-70M ($62M mid)	50 MWe utility-scale unit · 24-month delivery from PO · includes commissioning
Total project CAPEX (typical)	$92-98M	Includes site civils ($4M), interconnect ($8M), NH_3 infrastructure ($6M), permitting, owner's costs, IDC
$/kW project basis	$1,834-1,964/kW	Dramatically lower than Allam-Fetvedt ($2,000-3,000/kW) and NuScale SMR ($5,000-10,000/kW)
LCOE (S1 Premium Clean Firm)	~$280/MWh	At blue NH_3 $600/t · Tier 2 H_2 byproduct uplift
LCOE (S2 Industrial Cogen)	~$155/MWh	At onsite NH_3 $350/t · Tier 1.5 H_2 byproduct uplift · process heat sales

THREE-SCENARIO PROJECT IRR (WITH §45V H_2 BYPRODUCT UPLIFT)



S1: 18.6% energy-only baseline + 1.5 pts §45V H_2 byproduct = 20.1% · S2: 19.8% baseline + 2.6 pts H_2 uplift = 22.4% · S3 fails decisively — A2 cannot survive merchant pricing regardless of H_2 revenue

Best-fit buyer: A2 fits S2 Industrial Cogen Host precisely — industrial NH_3 pipeline access reduces fuel cost to $350/t, BTM avoidance captures $12M/yr demand charges + $8M/yr process heat, AmmoBurst H_2 byproduct provides $1.9M/yr at Tier 1.5 onsite blue/green pricing. **S2 Project IRR: 22.4% with 5-year payback on $92M total project CAPEX.**

Revenue Streams (S1 Premium Clean Firm Utility)

Energy contract (PPA)	$93.1M/yr	$250/MWh × 372,300 MWh-e/yr at 85% CF
ESG premium	$5.6M/yr	24/7 CFE verified · clean firm category pricing premium
Capacity payments	$2.5M/yr	$50/kW-yr · ISO market or utility regulated
§45Y Clean PTC (Y1-10)	$11.2M/yr	$30/MWh · 10-year window · prevailing-wage qualified
§45V H_2 byproduct (NEW)	$1.3M/yr	~1,270 t H_2/yr at $1.00/kg Tier 2 (blue NH_3) · architecturally unique to A2
Ancillary services	$1.5M/yr	Frequency regulation · spinning reserve · voltage support
Year 1 total revenue	**$115.1M**	Y11+ post-PTC: $103.9M annual

Why Aurora · Competitive Positioning

vs Allam-Fetvedt cycle (50 MW)	Lower CAPEX, no CCUS	A2 $1,904/kW vs $2,000-3,000/kW · A2 zero-emission without CO_2 capture/sequestration · A2 has H_2 byproduct revenue
vs NuScale SMR (60 MW)	2-5× lower CAPEX	A2 $98M vs $250-500M · A2 24-mo construction vs 60-84 mo · no nuclear permitting
vs CCGT (50 MW, gas)	Clean firm classification	A2 qualifies §45Y · A2 zero direct emissions · CCGT loses ESG positioning
vs CCGT + CCUS (50 MW)	No CO_2 infrastructure	A2 doesn't require CO_2 pipeline / sequestration / monitoring
vs Solar 150 MW + 4-hr Li BESS	True 24/7 firm	A2 dispatchable baseload · vs intermittent + BESS replacement Y10

AURORA'S HERITAGE SIDESTEP IP

✓ **SC-NH_3 + dissolved alkali σ mechanism** — fundamentally different electrochemistry than 1989-1993 DOE Faraday MHD failure (US patents pending DI-A2-001 through DI-A2-008)

✓ **3-pass toroidal Faraday channel topology** — multi-stage J×B extraction reduces per-pass field requirements

✓ **AmmoBurst MOF catalyst** — $NH_3 \leftrightarrow N_2+3H_2$ reversible chemistry · regenerative heat + §45V H_2 byproduct (architecturally unique to A2)

✓ **15 T REBCO HTS magnet integration** — modern HTS technology enables compact Faraday channel at utility scale

✓ **Aurora NeuroControl** — AI/ML real-time plasma control · 32-month head start on competitors

PATH TO COMMERCIAL OPERATION

- **Stage 1 (2026)** — Pre-hardware validation · Stage 1 components for SC-NH_3 containment, alkali dissolution chemistry, AmmoBurst catalyst · $20-32M Aurora budget
- **Stage 2 (2027-2029)** — FOAK build at industrial host site or utility partner · 36-month integrated commissioning
- **Stage 3 (2030+)** — Volume production · 2-3 units/year by 2032 · NH_3 supply chain consolidation · cost-down to $55M turnkey

Critical Risk · NH_3 Supply Chain: A2 commercial readiness depends on parallel maturation of utility-scale NH_3 infrastructure that Aurora doesn't directly control. The S5 Pivot scenario (5% probability in Plan §07) explicitly acknowledges A2 may fail to materialize commercially if NH_3 infrastructure doesn't develop or AmmoBurst MOF catalyst durability falls short. Aurora's Plan §02 identifies NH_3 procurement and AmmoBurst MOF as A2-critical supply chain items requiring vendor consolidation.

NEXT STEP

Contact CDW Research at Drumheller, AB to schedule a technical briefing or request a Stage 1 deployment quote. A2 Meridian Stage 1 NRE commitments currently being accepted from regulated utility, industrial cogen host, and premium clean firm IPP buyers. Tier 1 §45V H_2 byproduct pathway available with green NH_3 sourced offtake structure.