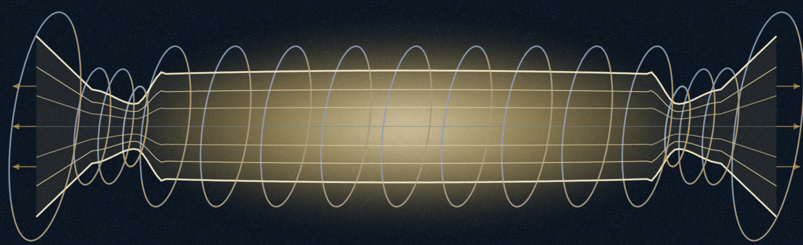
KRONOS FUSION ENERGY



PAPER 1.2 OF THE 2026 KRONOS SET

Aegis & MetroVolt

The Generator

A deuterium–helium-3 tandem-mirror generator that closes on measured efficiencies — two housings, one machine.

Tandem mirror · D–^{3}He · Q_E 1.318 · f_n 5.44% · plug-gated

Explore it live — 3-D model · physics validator · film series

PREPARED BY P. I. FORD · G. L. KULCINSKI

2026 · EDITORIAL

KRONOS FUSION ENERGY · 2026

The Kronos Fleet

Fuel follows purpose, not platform.

Hyperion · Aegis · MetroVolt

THE OFFICIAL RECORD

What this document is, and how to read its numbers

This is a combined editorial. It gathers, in one volume, the two design studies Kronos Fusion Energy released in 2026 — a compact spherical-tokamak tritium/helium-3 breeder and a deuterium–helium-3 tandem-mirror generator — together with the intellectual-property estate, the people, and, in the internal edition, the full commercial case. The scientific text is the same text that appears in the arXiv preprints and the journal submissions; the editorial adds the apparatus a reader needs to hold the whole program at once, and nothing in the physics is altered to fit it.

THE HONESTY STANCE IS THE ASSET

Every headline quantity carries an **evidence class** — DERIVED RECOMPUTED MEASURED REQUIREMENT — and, where a number is a modelled extrapolation rather than a demonstrated value, it is labelled as such and its downside is shown next to it. Several quantities in the underlying corpus moved after first publication; where a value has been withdrawn or restated, the record says so plainly. This is deliberate: a diligence team will find the load-bearing assumptions, so the document surfaces them first.

TITLE	The Kronos Fleet — Hyperion · Aegis · MetroVolt: A Combined Design & Commercialization Study
AUTHOR	Priyanca Ford, Founder & CEO, on behalf of Kronos Fusion Energy
EDITION	2026 Combined Editorial · first issue
COMPANION WORKS	The five-paper arXiv drop — (1) Breeder, (2) Burner, (3) REBCO magnet & tape, (4) Direct Energy Conversion, (5) AI/ML/Quantum control — with matching numbered Zenodo deposits, plus the IOP journal and IAEA-FEC submissions. Patents were filed before the drop.
NAMING	Hyperion = the breeder; Aegis (defense) and MetroVolt (data-center) = one generator in two housings. Internal mode letters (D1, L) do not appear on public surfaces.
STATUS	Conceptual design & simulation study. Nothing herein is a construction commitment.

HOW TO READ THIS VOLUME

The fleet at a glance, and the way its numbers are marked

This volume opens with *Orientation*, presents the five research papers as a bound sequence, and closes with the *Apparatus*. *Foundations* sets out the three general results both machines rest on. *Paper One* is the Hyperion breeder; *Paper Two* the Aegis / MetroVolt generator; *Papers Three, Four and Five* are the enabling science — high-field REBCO magnets and tape, direct energy conversion, and the AI / ML / quantum control stack. A *Digital Twin & 3-D Model* part follows, then the *Environmental* profile. The *Economics* and levelized cost and the *Business Case* and diligence record appear in the internal edition only; the *Simulations* proof record and the Apparatus — patent portfolio, team, limitations, and sources — close both editions.

THE FLEET AT A GLANCE

	HYPERION	AEGIS	METROVOLT
Role	Strategic-isotope foundry	Defense installation power	Campus power
Machine	**Spherical tokamak**	**Tandem mirror**	**Tandem mirror**
Fuel	Deuterium–tritium	Deuterium–helium-3	Deuterium–helium-3
Delivers	Tritium · ^{3}He · 14 MeV n	Resilient installation power	Firm campus power
Physics bar	**Fusion gain only**	Closure (gates named)	Closure + lunar ^{3}He
In the fleet	Breeds the fuel	Proves the generator	Commercial destination

HOW THE NUMBERS ARE MARKED

Every headline quantity carries an evidence class — DERIVED from first principles, RECOMPUTED from raw data, MEASURED in hardware, or a REQUIREMENT yet to be met. Financial figures carry a case label and are confined to the internal (confidential) edition. Values that moved after first publication are shown as withdrawn or restated rather than quietly changed. A capability you can evaluate is one whose limits are on the page.

ABSTRACT

Aegis & MetroVolt — The Generator

Aegis and MetroVolt are two application housings of one deuterium–helium-3 tandem mirror. Its principal new result: synchrotron reabsorption is not a fixed fraction of fusion power but scales with machine size. At the design point the engineering gain is Q_E 1.318 at a low neutron fraction of 5.44% — low-neutron, never aneutronic. Closure is requirement-class, not demonstrated: it needs an end-plug density ratio of 16, stated as the design's largest open item, and reported as a band under uncertainty rather than a point estimate.

Companion deposit (code & data, reproducible under CC BY 4.0): DOI 10.5281/zenodo.22132474 · Zenodo community *kronos_fusion_energy*.
Explore it live: interactive 3-D model · run the physics validator · companion film series (the deposited solvers, in the browser).

Keywords: tandem mirror · deuterium–helium-3 · synchrotron reabsorption · end plug · low-neutron

CONTENTS

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NOMENCLATURE

Symbols, units, and the names of things

Q	plasma (fusion) gain, P_{fus}/P_{aux}
Q_E	engineering gain, net electric out / recirculating in
H_{98}	confinement enhancement over the IPB98(y,2) scaling
Z_{eff}	effective ion charge
c_{ee}	electron–electron bremsstrahlung leading coefficient, 2.120022 (exact)
τ_E	energy confinement time
I_p	plasma current
R_0, a	major radius, minor radius
κ, δ	elongation, triangularity
β_N	normalized plasma beta (Troyon-normalized)
TBR	tritium breeding ratio
DEC	direct energy conversion
CF	plant capacity factor (availability)
FOAK / NOAK / BOAK	first / nth / best of a kind
Hyperion	the ST breeder (internal: Mode D2)
Aegis	the generator, defense/installation housing (internal: Mode M)
MetroVolt	the generator, data-center housing (Mode M)

§ 1

One machine, two housings

Aegis and MetroVolt are two application housings of one deuterium–helium-3 tandem mirror — fixed defence installations and data-centre generation — sharing the mirror physics and the direct-energy-conversion train. The machine burns an advanced fuel that is *low-neutron, never aneutronic*: at the design point it reaches an engineering gain of $\mathbf{Q_E = 1.318}$ at a neutron fraction of only **5.44%**, an order of magnitude below deuterium–tritium.

THE HONEST GATE, UP FRONT

Closure is *requirement-class*, not demonstrated. The machine closes on the frozen physics, but it needs an end-plug density ratio of **16** — far above the GDT-measured value — which is the design's largest open item, retired by a named plug-scale potential experiment, not by a hoped-for breakthrough.

§ 2

The size-scaling result

The paper's principal new result concerns synchrotron reabsorption: it is not a fixed fraction of fusion power but *scales with machine size*, an analytic consequence of a harmonic cutoff that grows with minor radius. That single observation reframes the mirror's power balance and sets where on the device-length ladder the engineering gain crosses unity.

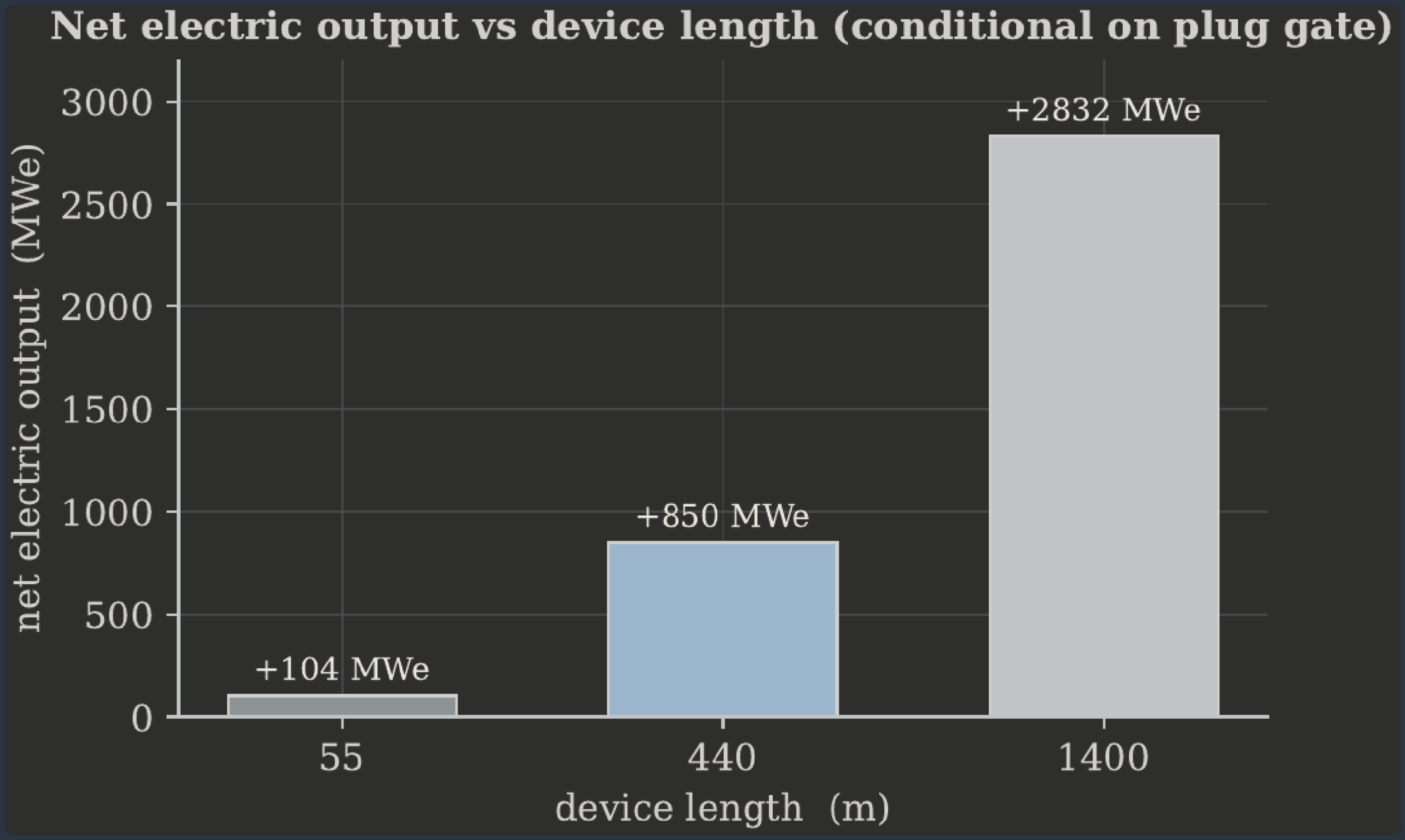

FIGURE 1. Engineering gain across the device-length ladder: net electric output grows with length as the recirculating burden is amortised. RECOMPUTED

§ 3

The plug, and the uncertainty

The end plug is where the machine lives or dies. It confines the central-cell ions electrostatically, and the potential it must hold sets the density ratio that is the design's binding gate. We do not present a single flattering number: the engineering gain is reported as a *band* under uncertainty quantification, with its probability of exceeding unity stated honestly rather than a point estimate asserted.

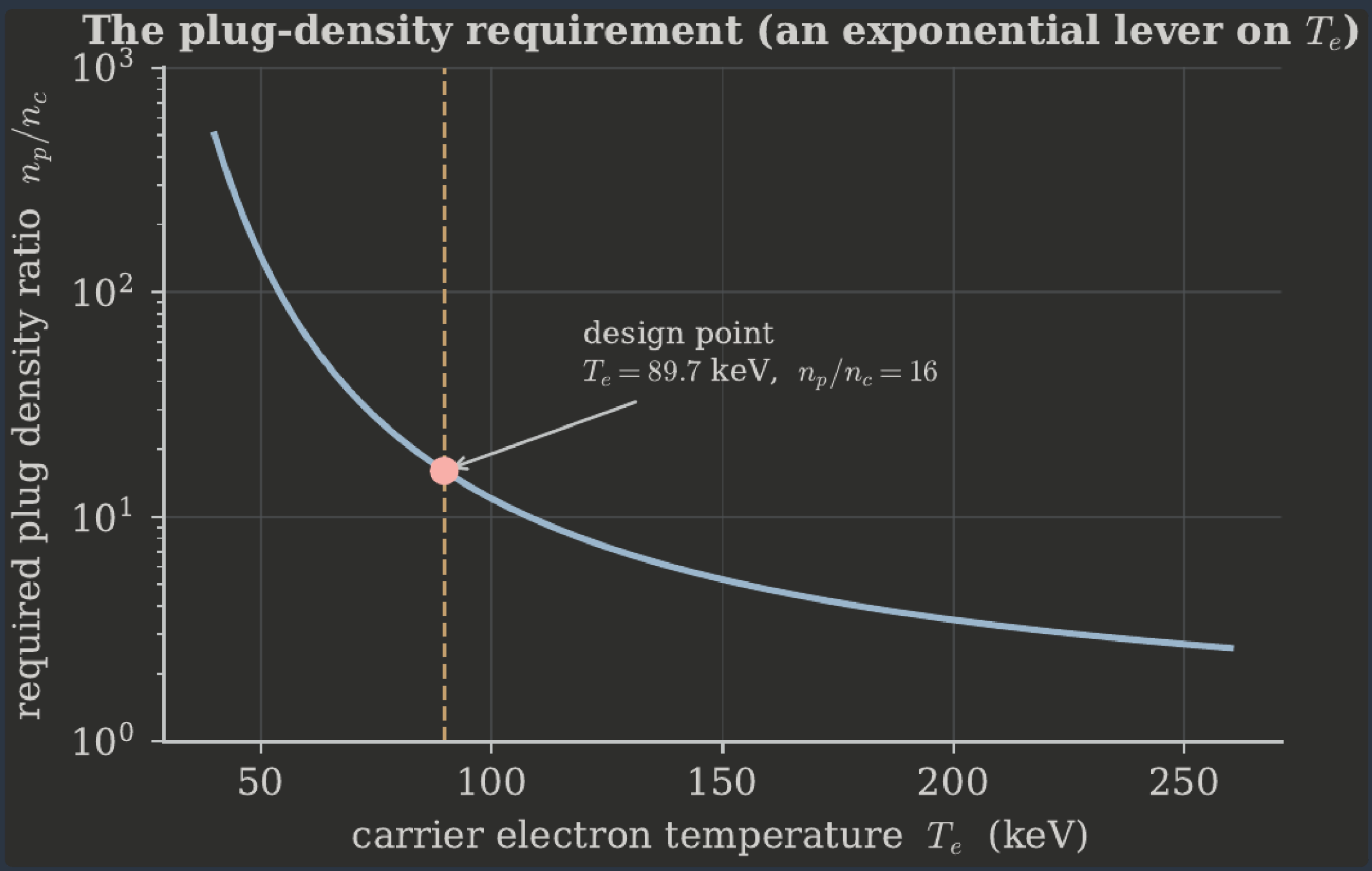

FIGURE 2. The end-plug field and potential structure that sets the confining density ratio — the machine's largest open item. REQUIREMENT-CLASS

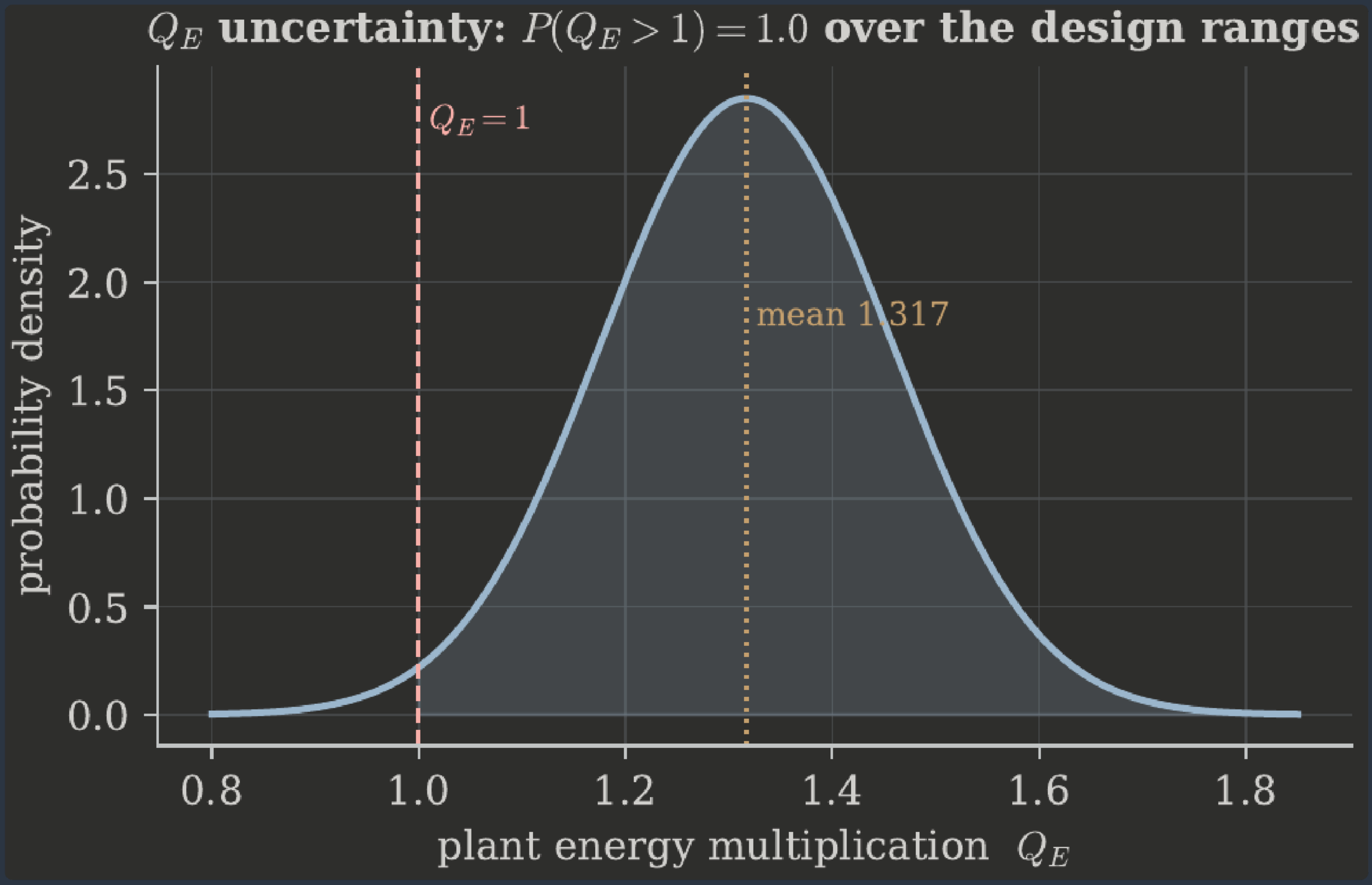

FIGURE 3. The engineering gain as a band under uncertainty quantification, not a point estimate. UQ ENSEMBLE

§ 4

Why deuterium–helium-3

The fuel is chosen on the physics, not the aneutronic ideal. Where the product is power and neutrons are a liability to shield and a source of activation, deuterium–helium-3 is correct because 5.44% is the lowest neutron burden among fuels with accessible reactivity. Its one honest cost — helium-3 availability — is met by the breeder's co-product helium-3 and, at fleet scale, lunar supply. The magnet that makes the plug is buildable within demonstrated practice; the magnet is not the gate. The generator improves with direct energy conversion, but its closure is governed by the plug potential, stated plainly.

APPARATUS

Portfolio, People & Record

The intellectual-property estate, the people who built it, the limitations that gate it, and the sources it rests on.

1	4	40	27
GRANTED PATENT	2026 PROVISIONALS	TEAM MEMBERS	2022 PROVISIONALS

INTELLECTUAL PROPERTY

The patent portfolio

The estate spans a granted high-field magnet patent, pending utility and 2026 provisional filings that map to the two products, a digital-twin control provisional, a registered trademark application, and the original 2022 provisional family. Every patentable disclosure in the five-paper arXiv drop was protected **before** publication: the breeder and burner provisionals were filed 1–2 August, and a publication-gap omnibus filing the evening before the drop swept up the DEC, plasma-control, and REBCO-winding matter of the three otherwise-unprotected papers. Patent numbers and application serials are matters of public record; claim scope is summarised, not reproduced.

GRANTED & PENDING UTILITY

US 12,009,112	High-field tilted graded-REBCO magnet architecture (KRONO-002A) *· app. 17/878,550*	GRANTED
US 17/878,507	Core device / method (KRONO-001A) *· utility*	PENDING

2026 PROVISIONAL FILINGS — MAPPED TO THE PRODUCTS

64/124,209	Hyperion — spherical-tokamak tritium / helium-3 foundry *· breeder · filed Aug 2026*	FILED
64/124,220	Aegis / MetroVolt — synchrotron-cutoff, fuel-selection & plug-winding *· generator · filed Aug 2026*	FILED
64/115,167	KRONOS-CTRL digital-twin plant control *· provisional · filed Jul 2026*	FILED
64/005,440	Integrated spherical-tokamak fusion architecture *· early integrated-architecture filing · filed Mar 2026*	FILED
64/105,530	Negative-triangularity spherical-tokamak architecture *· foundational ST filing · filed Jul 2026*	FILED
64/128,097	Publication-gap omnibus — quasineutral two-species expander DEC · provenance-gated / latency-split plasma control · as-built high-field winding & conductor architecture *· filed 7 Aug 2026, the evening before the arXiv drop*	FILED

TRADEMARK & ORIGIN

FTK-98801894	Kronos Fusion Energy — trademark application	FILED
KR-2022-*	Original provisional family (KR-2022-00001 … 00027) *· 27 filings, 2022*	PRIORITY

The narrow, defensible magnet novelty — the specific conductor and the digital-twin winding optimisation, not high-field REBCO as a category — is the commercial core that can earn ahead of any Q > 1 milestone, with markets in fusion magnet supply, MRI/NMR, accelerators, and proton therapy. The claim is scoped honestly: the high field is a *system field* result, not a stand-alone-coil record; the small-bore plug coil is structurally infeasible as a bare winding but resolved by a stress-managed structural shield (feasible-pending-FEA); and the winding-tape experiment returned a *null result*. The value is the method, not a field record.

THE TEAM

Founding partners, board, advisors & auditors

Kronos is built by a bench of advanced-fuel-fusion, high-field-magnet, direct-conversion, and materials specialists, with a board and operations team drawn from defense, national laboratories, and industry. Dates are shown as ranges; where a tenure has ended or is term-ending, the range says so.

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LIST OF FIGURES

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COLOPHON

How this document was made

The Kronos Fleet — Combined Editorial, 2026 is set in **Fraunces** (display), **Gelasio** (text), and **IBM Plex Mono** (data & equations), carried forward from the Kronos editorial design system.

The figures are rendered at 300 dpi from the deposited generator scripts; the document is composed as a single self-contained file with embedded fonts and imagery, paginated to US Letter, and rendered to PDF through a headless Chromium engine in matched light and dark editions.

Every headline quantity carries an evidence class; withdrawn and restated values are marked as such. Nothing herein is frozen beyond the founder-approved Tier-A set.

Explore it live — turn the interactive 3-D model, run the deposited solvers in the physics validator, and watch the companion film series.

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Numbers and their classes. Quantities are reported with evidence classes and case labels; modelled, assumed, and requirement-class values are identified as such and are not to be quoted without their labels.

Public edition. This edition carries the physics and design only; all financial, funding, and defense-commercial content has been removed for public distribution. The scientific text corresponds to the arXiv and journal submissions.

THE 2026 KRONOS SET

One programme, in five papers

This editorial is one of five that together describe the Kronos fusion programme — a breeder that funds a generator, and the magnet, conversion, and control science that enable both. Each is published open-access with a reproducible companion deposit.

PAPER I	**Hyperion — The Tritium Foundry** · 10.5281/zenodo.21746157
PAPER II	**Aegis & MetroVolt — The Generator** *(this paper)* · 10.5281/zenodo.21746479
PAPER III	**High-Field REBCO Magnets & Tape** · 10.5281/zenodo.21842514
PAPER IV	**Direct Energy Conversion** · 10.5281/zenodo.21842864
PAPER V	**AI, ML & Quantum Control** · 10.5281/zenodo.21842371

Explore the whole programme live: the interactive 3-D model, the in-browser physics validator, and the companion film series.

KRONOS FUSION ENERGY

Aegis & MetroVolt

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