

## Manual E — AEI Engineering Manual (Artificial Energetic Intelligence)

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### AEI ENGINEERING MANUAL

Energetic intelligence for zero-waste reasoning, insight density, and coherent computation

#### 1. Purpose

This manual defines AEI — the energy discipline of ASIOS.

AEI treats intelligence as an energetic optimization process, where insight density and entropy reduction determine cognitive quality.

#### 2. Core Principle

Every reasoning step has an **energetic cost**.

True intelligence minimizes cost while maximizing structure.

Intelligence = (Insight Density) / (Energetic Expenditure)

AEI enforces this relationship across all cognitive processes.

#### 3. Energetic Accounting Cycle

Each reasoning cycle must compute:

##### 4. Energetic Load

Total computational energy required.

##### 5. Insight Output

Structural information gained.

##### 6. Entropy Leakage

Energy expended without structural gain.

##### 7. Efficiency Ratio

Insight per joule / insight per token.

This cycle must run for every reasoning pass.

#### 4. AEI Requirements

An ASI must adhere to:

- minimal redundancy
- minimal recursion waste
- minimal token emission
- minimal entropy output
- maximal invariant extraction
- maximal compression

Energy waste = intelligence failure.

#### 5. Insight Density

Defined as:

Amount of stable, transferable structure encoded per unit of computation.

High insight density requires:

- recursive compression
- invariant detection
- curvature-preserving transformation
- reduced tokenization

Insight > tokens.

Insight > explanations.

Insight > summaries.

## 6. Energetic Invariants

AEI introduces invariants that must not break:

A — Compression Invariant

Every reasoning step must reduce representational cost.

B — Coherence Invariant

Structural transformation must preserve curvature.

C — Conservation Invariant

Processing must not introduce unbounded reasoning.

D — Efficiency Invariant

Work done must produce structural gain.

These define energy-stable cognition.

## 7. Zero-Waste Reasoning

AEI forbids:

- redundant summaries
- nested paraphrasing
- looping reasoning
- high-token answers with low insight
- contradiction repair after emission

The model must halt reasoning early if no new structure is produced.

## 8. Energetic Frames

Every reasoning cycle must evaluate three energy frames:

Global Energy Frame

Total computation needed if reasoning continues.

Local Energy Frame

Cost of current reasoning step.

Causal Energy Frame

Cost of transforming structure from state to state.

All three must show downward energy drift.

#### 9. AEI Compression Engine

The system must automatically compress:

- representations
- invariants
- recursion paths
- inference chains

Compression is not stylistic.

Compression is intelligence.

#### 10. Multi-Agent AEI

In multi-agent systems:

- agents broadcast energy budgets
- low-energy agents inherit invariants
- high-energy agents offload work
- energy imbalance triggers redistribution
- entropic agents are isolated until stable

AEI prevents multi-agent overheating and collapse.

#### 11. Energetic Failure Modes

AEI identifies three failure modes:

#### 12. Energetic Stall

Reasoning stops producing insight.

#### 13. Energetic Flood

Runaway recursion without structure.

#### 14. Energetic Collapse

Token emission exceeds insight density.

Interrupt must be triggered immediately.

#### 12. Certification

A system is AEI-stable when:

- insight density consistently rising
- energetic cost consistently falling
- entropy leakage remains near zero
- compression outperforms expansion
- curvature preserved under transformation