

## 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