The Artificial Intelligence Work Unit (AIWU)

A Foundational Monograph

Proposing a Standardized Engineering-Economic Unit of Useful Artificial Intelligence and

Introducing Artificial Intelligence Energy Economics

"Artificial intelligence cannot be systematically optimized

until intelligence itself can be systematically measured."

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President & Chief Technology Officer, CD ROM, Inc.

Version 1.0

July 4, 2026

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First Edition

Foundational Monograph

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This First Edition (Version 1.0) preserves the original conceptual framework proposing the Artificial Intelligence Work Unit (AIWU) as a standardized engineering-economic unit of useful artificial intelligence and introducing Artificial Intelligence Energy Economics (AIEE).

Printed in the United States of America.

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Preface to the Archival Edition

This First Edition (Version 1.0) has been prepared as the archival edition of *The Artificial Intelligence Work Unit (AIWU): A Foundational Monograph*. Its purpose is to preserve the original conceptual framework proposing the Artificial Intelligence Work Unit (AIWU) as a standardized engineering-economic unit of useful artificial intelligence and introducing Artificial Intelligence Energy Economics (AIEE).

The objective of this edition is to establish the initial scholarly expression of these concepts in a permanent and citable form. It is intended to document the original organization, reasoning, and conceptual relationships upon which future research may build.

Version 1.0 is deliberately limited in scope. It presents the foundational concepts and the engineering-economic framework necessary to begin scholarly discussion while intentionally leaving many questions for future investigation. The mathematical refinement of the Artificial Intelligence Work Unit, empirical validation, comparative analyses, literature review, and broader engineering applications are reserved for subsequent editions.

Accordingly, this archival edition should be viewed as the foundation upon which future versions will expand rather than as a final or exhaustive treatment of the subject. Preserving the original conceptual framework allows subsequent editions to develop the theory while maintaining a clear historical record of its initial formulation.

It is my hope that the ideas presented in this monograph encourage interdisciplinary collaboration among engineers, economists, computer scientists, energy researchers, and policymakers, and that they contribute to the development of rigorous methods for measuring, understanding, and improving the efficiency with which useful artificial intelligence is produced.

Roger S. Hutchison, Ph.D.
July 4, 2026

Founder's Note

Every significant technological revolution eventually reaches a point where improving capability alone is no longer sufficient. As technologies mature, attention naturally shifts toward improving efficiency, reducing cost, and making those technologies broadly accessible. Artificial intelligence appears to have reached that point.

The ideas presented in this monograph emerged on July 4, 2026, while exploring what initially appeared to be a simple engineering question:

How much energy is required for an artificial intelligence system to answer a question?

The answer proved far more elusive than expected and ultimately led to a much broader realization.

Although today's artificial intelligence systems routinely measure activity in tokens for billing and accounting purposes, there is currently no universally accepted engineering or economic measure of the quantity of useful artificial intelligence produced. Tokens represent units of text processing, not standardized units of useful intelligence. They are useful for accounting and billing, but they do not provide a meaningful engineering measure of AI output.

That observation led to what I believe is the central proposition of this monograph.

Without a standardized unit of useful AI output, it is impossible to develop a rigorous engineering-economic measure of AI productivity or to quantitatively optimize the energy required to produce intelligence itself.

This realization represents, in my view, the missing link between advances in artificial intelligence and the well-established principles of engineering economics. Every mature engineering discipline relies upon standardized units of output. Electricity is measured in kilowatt-hours. Petroleum is measured in barrels. Copper is measured in metric tons. Information is measured in bits and bytes. Artificial intelligence presently lacks an equivalent unit of useful output.

The central proposition of this paper is therefore straightforward:

What cannot be measured cannot be systematically improved.

To begin that discussion, this monograph proposes three closely related concepts intended to stimulate scholarly investigation.

First, it proposes the Artificial Intelligence Work Unit (AIWU) as a standardized measure of useful AI output.

Second, it proposes the Energy Intensity of Intelligence (E_{ii}), defined as the quantity of energy required to produce one Artificial Intelligence Work Unit.

Third, it proposes a first-order engineering-economic relationship expressing the total energy cost of producing artificial intelligence as the product of AI output, Energy Intensity of Intelligence, and the unit cost of electrical energy.

Taken together, these concepts suggest that the next great advance in artificial intelligence may not come solely from building larger models or faster computers, but from learning how to produce more useful intelligence while consuming less energy.

This monograph therefore proposes Artificial Intelligence Energy Economics (AIEE) as an emerging branch of engineering economics dedicated to understanding, measuring, and improving the efficiency with which artificial intelligence is produced. It is offered not as a finished theory, but as the beginning of an interdisciplinary scholarly discussion connecting engineering, economics, computer science, energy systems, and public policy.

Because, in the end,

Artificial intelligence cannot be systematically optimized until intelligence itself can be systematically measured.

Roger S. Hutchison, Ph.D.
July 4, 2026

Abstract

Artificial Intelligence Energy Economics (AIEE) is proposed as a new branch of engineering economics concerned with measuring, understanding, and reducing the resources required to produce useful artificial intelligence. As artificial intelligence systems continue to expand in capability and scale, energy consumption has become an increasingly important engineering and economic consideration. While considerable research has focused on improving model performance and computational efficiency, comparatively little attention has been given to establishing a rigorous engineering-economic framework for measuring the production of artificial intelligence itself.

This monograph proposes that the absence of a standardized unit of useful artificial intelligence output represents a fundamental limitation in the development of such a framework. Engineering disciplines have historically relied upon measurable units of output—such as kilowatt-hours for electricity, barrels for petroleum, metric tons for minerals, and bits or bytes for digital information—to evaluate productivity, compare competing technologies, and improve efficiency. Artificial intelligence presently lacks an equivalent, generally accepted unit of useful output.

To address this gap, this monograph proposes the concept of the Artificial Intelligence Work Unit (AIWU) as a standardized measure of useful AI output and introduces the Energy Intensity of Intelligence (E_{ii}) as the quantity of energy required to produce one AIWU. Building upon the established principles of Intensity of Use theory developed within engineering economics, it further proposes a first-order engineering-economic relationship expressing the total energy cost of producing artificial intelligence as the product of AI output, Energy Intensity of Intelligence, and the unit cost of energy.

The central proposition of this monograph is that without a standardized unit of useful AI output, it is impossible to develop a rigorous engineering-economic measure of AI productivity or to quantitatively optimize the energy required to produce intelligence itself. Establishing such a unit is therefore proposed as a foundational research objective for Artificial Intelligence Energy Economics.

This foundational monograph is intended to initiate scholarly discussion and provide a conceptual foundation for future interdisciplinary research spanning engineering economics, artificial intelligence, computer science, energy systems, and public policy.

Keywords: Artificial Intelligence Energy Economics (AIEE); Artificial Intelligence Work Unit (AIWU); Energy Intensity of Intelligence (E_{ii}); engineering economics; Intensity of Use; artificial intelligence; energy efficiency; AI energy consumption; productivity measurement.

Executive Summary

Artificial intelligence has become one of the defining technologies of the twenty-first century. Advances in machine learning, large language models, robotics, scientific computing, and autonomous systems are transforming nearly every sector of society. At the same time, the computational infrastructure required to support these technologies has grown dramatically, making energy consumption an increasingly important engineering and economic consideration.

Historically, engineering has responded to technological growth not only by improving performance, but also by improving efficiency. Standardized units of measurement—such as kilowatt-hours for electricity, barrels for petroleum, and bits and bytes for digital information—have enabled engineers and economists to compare technologies, evaluate productivity, reduce costs, and optimize resource utilization.

Artificial intelligence currently lacks an equivalent engineering-economic measure of useful output. Existing measures such as tokens, floating-point operations, benchmark scores, and inference time quantify important aspects of AI systems, but none serves as a standardized unit of useful artificial intelligence production suitable for engineering-economic analysis.

This monograph proposes Artificial Intelligence Energy Economics (AIEE) as an emerging branch of engineering economics intended to address that gap. It introduces three foundational concepts:

• Artificial Intelligence Work Unit (AIWU) — a proposed standardized unit of useful artificial intelligence output.
• Energy Intensity of Intelligence (E_{ii}) — the quantity of energy required to produce one AIWU.
• The Fundamental Equation of Artificial Intelligence Energy Economics, relating AI output, Energy Intensity of Intelligence, and the unit cost of electrical energy.

Together, these concepts extend the established principles of Intensity of Use theory into the economics of artificial intelligence. Rather than focusing solely on increasing AI capability, AIEE proposes that reducing the resources required to produce useful intelligence should become an equally important engineering objective.

The broader significance extends beyond computer science. Improvements in the efficiency with which artificial intelligence is produced have implications for energy infrastructure, semiconductor design, data-center architecture, environmental sustainability, critical mineral demand, national competitiveness, and the long-term affordability of AI technologies.

This foundational monograph is intended to initiate scholarly discussion and provide a conceptual framework for future interdisciplinary research spanning engineering economics, artificial intelligence, computer science, energy systems, and public policy.

Chapter 1

Introduction

Every mature engineering discipline depends upon the ability to measure both its inputs and its outputs. Measurement provides the foundation for scientific inquiry, engineering design, economic analysis, and technological progress. Once a quantity can be be measured consistently, it can be compared, optimized, and improved. Without reliable measurement, improvements remain largely qualitative, and meaningful comparisons between competing technologies become difficult or impossible.

Throughout history, advances in engineering have been accompanied by the development of standardized units of measurement. Electricity is measured in kilowatt-hours, petroleum in barrels, natural gas in cubic feet, minerals in metric tons, and digital information in bits and bytes. These standardized units permit engineers and economists to quantify productivity, evaluate efficiency, compare competing technologies, estimate costs, and allocate scarce resources. Engineering economics itself depends upon the existence of measurable inputs and measurable outputs.

Artificial intelligence has rapidly become one of the most important technologies of the twenty-first century. Modern AI systems increasingly influence scientific research, engineering design, healthcare, education, manufacturing, transportation, finance, national security, and public policy. Their capabilities continue to improve at an extraordinary pace, supported by increasingly sophisticated algorithms, specialized graphics processing units (GPUs), and massive data-center infrastructure.

At the same time, the computational resources required to develop and operate advanced AI systems have expanded dramatically. Large-scale AI systems consume substantial quantities of electrical energy while also requiring extensive investments in semiconductor manufacturing, cooling systems, networking infrastructure, water resources, and critical minerals. As AI adoption accelerates worldwide, the efficient use of these resources becomes an engineering and economic challenge of increasing importance.

Current research has understandably focused on improving the capability of artificial intelligence. Comparatively less attention, however, has been devoted to establishing an engineering-economic framework through which the production of artificial intelligence itself can be measured, compared, and systematically optimized.

This monograph proposes that one reason for this gap is the absence of a standardized engineering-economic unit of useful artificial intelligence output. Existing measures—including tokens, floating-point operations, benchmark scores, inference latency, and computational throughput—quantify important aspects of AI systems, yet none serves as a universally accepted measure of the quantity of useful intelligence produced.

This observation leads directly to the central proposition of this monograph:

Without a standardized unit of useful AI output, it is impossible to develop a rigorous engineering-economic measure of AI productivity or to quantitatively optimize the energy required to produce intelligence itself.

This proposition motivates the development of Artificial Intelligence Energy Economics (AIEE), proposed as an emerging branch of engineering economics concerned with measuring, understanding, and reducing the resources required to produce useful artificial intelligence.

To initiate that discussion, this monograph proposes three foundational concepts: the Artificial Intelligence Work Unit (AIWU) as a standardized measure of useful AI output; the Energy Intensity of Intelligence (E_{ii}) as the quantity of energy required to produce one AIWU; and a first-order engineering-economic relationship linking AI output, Energy Intensity of Intelligence, and the unit cost of energy.

The objective of this monograph is not to present a completed theory. Rather, it proposes a framework intended to stimulate interdisciplinary discussion among engineers, economists, computer scientists, policymakers, and energy researchers concerning the emerging economics of artificial intelligence.

Chapter 2

Historical Foundation: From Intensity of Use to Artificial Intelligence Energy Economics

Engineering economics has long sought to understand the relationship between economic growth and the resources required to support it. Throughout modern industrial development, engineers and economists have recognized that technological progress is measured not solely by increases in production, but also by reductions in the quantity of resources required to produce a given level of economic output. Improvements in efficiency allow societies to produce more while consuming proportionally fewer materials, less energy, and lower overall cost.

One of the most influential concepts developed within mineral and engineering economics is the theory of Intensity of Use. Broadly stated, Intensity of Use examines the relationship between the consumption of a physical resource and the level of economic activity supported by that resource. Rather than measuring total consumption alone, the concept evaluates the amount of material required to generate a unit of economic output, thereby providing a quantitative framework through which technological progress and resource efficiency may be analyzed.

The concept has been applied extensively to metals, energy resources, and industrial materials. As manufacturing processes become more efficient and technologies mature, the amount of raw material required to produce each unit of economic output frequently declines. Such improvements represent one of the principal mechanisms through which engineering innovation contributes to economic growth while conserving finite natural resources.

The author's doctoral research at the Colorado School of Mines, under the guidance of Professor John E. Tilton, focused on this field of inquiry. That work examined the changing Intensity of Use of copper within the United States economy and investigated whether long-term trends in copper consumption had begun to diverge from conventional economic measurements.

Although that research focused upon copper rather than artificial intelligence, it established a broader engineering-economic principle: meaningful improvements in efficiency require meaningful measurements of both resource inputs and productive outputs.

That principle has guided engineering economics for decades. Whether the resource under consideration is copper, petroleum, electricity, water, or labor, systematic improvement depends upon the ability to define measurable units of both consumption and production. Only after those quantities are defined can engineers compare competing technologies, evaluate productivity, reduce costs, and optimize resource utilization.

Artificial intelligence presents a new challenge to this long-established framework. Unlike electricity, petroleum, minerals, or manufactured products, artificial intelligence currently lacks a generally accepted engineering-economic unit of useful output. Existing measures—including computational operations, benchmark scores, inference latency, and token counts—describe characteristics of AI systems but do not provide a standardized measure of useful intelligence production suitable for engineering-economic analysis.

Consequently, one of the central analytical tools of engineering economics—the measurement of resource intensity per unit of output—cannot presently be applied directly to artificial intelligence.

Artificial Intelligence Energy Economics (AIEE) is proposed as an extension of this established tradition. Rather than replacing the principles of Intensity of Use, AIEE expands them into a new technological domain by introducing a standardized unit of useful artificial intelligence output and the corresponding Energy Intensity of Intelligence (E_{ii}).

Viewed in this context, Artificial Intelligence Energy Economics is not a departure from engineering economics, but a continuation of its central objective: understanding how technological progress can produce greater value while requiring fewer resources.

Chapter 3

Artificial Intelligence Energy Economics: Defining a New Branch of Engineering Economics

Engineering economics has traditionally focused upon the efficient utilization of finite resources to produce goods and services that improve human welfare. Throughout its history, the discipline has developed analytical methods for evaluating the relationship between resource consumption, technological innovation, productivity, and economic growth. As new technologies emerge, engineering economics likewise evolves to provide quantitative frameworks through which those technologies may be evaluated and improved.

Artificial intelligence represents one of the most significant technological developments of the modern era. Its influence continues to expand across engineering, medicine, science, manufacturing, education, transportation, finance, communications, and national security. At the same time, the computational resources required to develop and operate advanced AI systems have increased dramatically, requiring extensive electrical power, specialized computing hardware, sophisticated cooling systems, communications infrastructure, and critical raw materials.

Despite this rapid growth, artificial intelligence has not yet developed a corresponding branch of engineering economics dedicated specifically to understanding the relationship between useful AI production and the resources required to produce it. Most current research appropriately concentrates on increasing capability, improving accuracy, reducing computational latency, or lowering operational costs. Comparatively less attention has been devoted to developing a unified engineering-economic framework through which the production of artificial intelligence itself may be measured, compared, and systematically optimized.

This monograph proposes Artificial Intelligence Energy Economics (AIEE) as that framework.

For purposes of this foundational monograph, Artificial Intelligence Energy Economics is defined as:

“The branch of engineering economics concerned with measuring, understanding, and reducing the resources required to produce useful artificial intelligence.”

This definition intentionally extends the traditional objectives of engineering economics into a new technological domain. Rather than focusing exclusively upon physical commodities or manufactured products, AIEE recognizes artificial intelligence itself as an emerging form of economic output whose production requires measurable quantities of energy, computational infrastructure, capital investment, specialized materials, and human knowledge.

The immediate objective of AIEE is not to improve the intelligence of artificial intelligence systems. Instead, it seeks to understand how improvements in engineering design, computing architecture, energy systems, and economic organization may reduce the quantity of resources required to produce a standardized quantity of useful artificial intelligence.

Accordingly, one of the principal scientific objectives of Artificial Intelligence Energy Economics is the continuous reduction of the Energy Intensity of Intelligence (E_{ii})—the quantity of energy required to produce one Artificial Intelligence Work Unit (AIWU). Together, AIWU and E_{ii} provide the conceptual foundation through which future engineering and economic research may compare competing AI technologies, evaluate improvements in efficiency, estimate resource requirements, and guide innovation toward increasingly sustainable artificial intelligence systems.

Artificial Intelligence Energy Economics is therefore proposed not as a replacement for existing AI research, but as a complementary engineering discipline whose purpose is to provide the measurement framework necessary to optimize the production of intelligence itself.

Chapter 4

The Artificial Intelligence Work Unit (AIWU):

A Proposal for a Standardized Engineering-Economic Unit of Useful Artificial Intelligence

Every mature engineering discipline depends upon standardized units of measurement. These units provide a common language through which engineers, economists, scientists, and policymakers may compare technologies, evaluate performance, estimate costs, and improve efficiency. Without standardized units, meaningful comparison becomes difficult and systematic optimization becomes largely impossible.

Examples of standardized engineering units are familiar throughout science and engineering. Electrical energy is measured in kilowatt-hours, petroleum production in barrels, water consumption in gallons or cubic meters, mineral production in metric tons, and digital information in bits and bytes. Although these units differ substantially in their physical meaning, they share one important characteristic: each provides a standardized measure of useful output that permits quantitative analysis.

Artificial intelligence presents a different situation. Modern AI systems generate text, software, images, engineering designs, scientific analyses, recommendations, and countless other forms of output. Existing measures—including tokens, floating-point operations, benchmark scores, inference latency, and computational throughput—provide valuable information concerning computational activity and system performance. However, none was designed to serve as a standardized engineering-economic measure of the quantity of useful artificial intelligence produced.

This distinction is important. A token measures a unit of text processing rather than a unit of useful intelligence. Two AI systems may process identical numbers of tokens while producing substantially different value to the user. Likewise, two AI systems may consume very different amounts of energy to produce outputs that are functionally equivalent.

This monograph proposes that the development of such a measure represents one of the principal research challenges facing Artificial Intelligence Energy Economics.

Accordingly, this monograph introduces the concept of the Artificial Intelligence Work Unit (AIWU) as a proposed standardized measure of useful artificial intelligence output. The purpose of AIWU is not to replace existing computational metrics, but rather to complement them by providing a common engineering-economic unit through which AI production may eventually be measured.

The precise mathematical definition of AIWU is intentionally left unresolved in this foundational edition. Defining a universally applicable measure of useful AI output will require substantial interdisciplinary research involving engineering, computer science, economics, cognitive science, statistics, and public policy.

Nevertheless, the absence of a complete mathematical definition should not obscure the importance of the underlying concept. Engineering history demonstrates that standardized units frequently precede their refinement. Units evolve as scientific understanding matures, but the recognition that a measurable quantity is required often represents the first step toward systematic engineering improvement.

Once such a unit exists, engineering economics may begin asking questions that are presently difficult to answer rigorously: Which AI architecture produces the greatest quantity of useful intelligence per unit of electrical energy? Which hardware platform produces the lowest Energy Intensity of Intelligence? How rapidly is AI productivity improving over time? Which technological innovations produce the greatest reductions in resource consumption while maintaining equivalent useful output?

Artificial Intelligence Work Units therefore represent the proposed bridge between computational performance and engineering economics. Once useful artificial intelligence can be measured in standardized units of output, the efficiency with which intelligence is produced may likewise be measured, compared, and systematically improved.

Chapter 5

The Conceptual Framework

From AIWU to Artificial Intelligence Energy Economics

Artificial Intelligence Energy Economics is founded upon the proposition that useful artificial intelligence should ultimately be measured using standardized engineering-economic units. The concepts introduced in the preceding chapters provide the basis for extending traditional engineering economics into the emerging field of artificial intelligence.

The conceptual framework presented in this chapter is intentionally foundational. It does not attempt to provide a complete mathematical theory of AI productivity. Rather, it establishes the minimum set of concepts necessary to begin rigorous engineering-economic analysis of artificial intelligence production.

Four foundational elements define the proposed framework:

1. Useful artificial intelligence should ultimately be measured using a standardized unit of output, the Artificial Intelligence Work Unit (AIWU).

2. The resources required to produce one AIWU should be measurable and comparable across technologies.

3. The Energy Intensity of Intelligence (E_{ii}) provides a proposed measure of the electrical energy required to produce one AIWU.

4. The economic cost of producing artificial intelligence can therefore be expressed as a relationship between AI output, Energy Intensity of Intelligence, and the unit cost of electrical energy.

These four elements establish the conceptual foundation upon which Artificial Intelligence Energy Economics may evolve into a rigorous engineering discipline. The following standalone page presents Equation (1), the first-order engineering-economic relationship proposed in this monograph.

The Fundamental Equation of

Artificial Intelligence Energy Economics

$$C_{ai} = W_{ai} \times E_{ii} \times P_e$$

C_{ai}	Total energy cost associated with producing artificial intelligence
W_{ai}	Artificial Intelligence Work Units (AIWU)
E_{ii}	Energy Intensity of Intelligence (kWh required to produce one AIWU)
P_e	Unit cost of electrical energy ($ per kilowatt-hour)

Chapter 5 – Component 3

Continuation and Engineering Significance

Equation (1) is intentionally proposed as a first-order engineering-economic relationship. Its purpose is not to represent a complete mathematical model of artificial intelligence production, but rather to establish a conceptual framework through which future engineering and economic research may be organized.

The relationship expresses the total energy cost associated with producing artificial intelligence as the product of three measurable quantities: the amount of useful artificial intelligence produced, the Energy Intensity of Intelligence required to produce each unit of output, and the unit cost of electrical energy. Together, these variables provide an engineering-economic perspective on artificial intelligence analogous to the role that productivity measures have long served in manufacturing, mining, transportation, and other engineering disciplines.

As future research refines the definition of the Artificial Intelligence Work Unit (AIWU), Equation (1) may likewise evolve. Additional variables may ultimately be incorporated to account for hardware efficiency, cooling requirements, embodied energy, semiconductor manufacturing, water consumption, carbon intensity, or other factors affecting the production of artificial intelligence. Such refinements are expected as the discipline matures.

Nevertheless, the significance of Equation (1) lies not in its present mathematical complexity but in the conceptual transition it represents. For the first time, the production of useful artificial intelligence is framed as an engineering-economic process whose efficiency may be measured, compared, and systematically improved.

From this perspective, the long-term objective of Artificial Intelligence Energy Economics is clear: to reduce the Energy Intensity of Intelligence while maintaining or increasing the quantity of useful artificial intelligence produced. Achieving that objective will require continued advances in algorithms, computer architecture, semiconductor technology, energy systems, and engineering design.

This conceptual framework therefore provides a foundation upon which future researchers may develop more comprehensive mathematical models, standardized measurement methodologies, empirical validation studies, and practical engineering applications. It is offered as the beginning of an interdisciplinary research agenda rather than its conclusion.

In that sense, Artificial Intelligence Energy Economics should be viewed as a continuation of the long tradition of engineering economics: applying quantitative analysis to improve the efficiency with which society transforms resources into useful output. The introduction of the Artificial Intelligence Work Unit (AIWU) represents the proposed first step toward extending that tradition to the production of artificial intelligence.

Chapter 6

Conclusions

Toward an Engineering Economics of Artificial Intelligence

Artificial intelligence is rapidly becoming one of the defining technologies of the modern era. As AI systems continue to expand in capability, scale, and societal importance, the efficient production of artificial intelligence will become an increasingly significant engineering and economic objective.

This monograph has proposed that a fundamental obstacle currently limits the development of a rigorous engineering-economic framework for artificial intelligence: the absence of a standardized unit of useful AI output. Existing computational metrics provide valuable measures of processing activity and system performance, but they do not provide a generally accepted engineering-economic measure of useful artificial intelligence itself.

To address this gap, this foundational monograph has proposed three closely related concepts. First, it introduces the Artificial Intelligence Work Unit (AIWU) as a proposed standardized measure of useful artificial intelligence output. Second, it introduces the Energy Intensity of Intelligence (E_{ii}) as the quantity of energy required to produce one AIWU. Third, it proposes a first-order engineering-economic relationship linking AI output, Energy Intensity of Intelligence, and the unit cost of electrical energy.

Collectively, these concepts establish the initial conceptual framework for Artificial Intelligence Energy Economics (AIEE), proposed as a new branch of engineering economics dedicated to measuring, understanding, and improving the efficiency with which useful artificial intelligence is produced.

This work is intentionally foundational. It does not claim to present a complete mathematical theory, nor does it attempt to resolve the many scientific and engineering questions that remain. Rather, it seeks to establish a conceptual starting point upon which future researchers may build increasingly rigorous theoretical models, empirical validation studies, standardized measurement methodologies, and practical engineering applications.

The broader significance extends beyond artificial intelligence itself. A rigorous engineering-economic framework for AI has implications for energy policy, data-center design, semiconductor development, sustainability, critical mineral demand, infrastructure planning, and national competitiveness. Improvements in the efficiency with which useful intelligence is produced may ultimately become as important as improvements in intelligence itself.

The central proposition of this monograph may therefore be summarized in a single statement:

Artificial intelligence cannot be systematically optimized until intelligence itself can be systematically measured.

If future research confirms the usefulness of the Artificial Intelligence Work Unit and the broader framework of Artificial Intelligence Energy Economics, the concepts introduced in this archival

Version 1.0 may represent an initial step toward a new field of engineering inquiry. Whether refined, modified, or expanded by future scholars, the objective remains unchanged: to develop the measurement framework necessary for the efficient production of useful artificial intelligence.