No Ceiling, No Denominator, No Exit

Artificial intelligence and the architecture of American energy law

For half a century the United States has run a federal program to make machines use less energy. It has never once run a program to make the country use less energy. The Energy Policy and Conservation Act regulates efficiency, which is a ratio, and contains no authority to set a ceiling on aggregate consumption. That was tolerable while the ratio and the total moved together. Artificial intelligence has pulled them apart, and the gap is structural: it appears in coverage, in disclosure, and in allocation.

Travis Gilly · Founder and Executive Director, Real Safety AI Foundation · ORCID 0009-0007-2954-6313

Working draft, July 2026 · Preprint: SSRN

33×

down. The energy to answer a median Gemini text prompt fell by a factor of 33 in twelve months. The ratio improved.

+37%

up. In the same year the company's electricity demand rose 37 percent, the largest annual increase in its history. The total exploded.

> *Both numbers are true. The statute can read one of them. The mechanism is a fraction.*

Sources Google AI Scale (2025); Google 2026 Environmental Report Blog (June 30, 2026); Clancy, Trellis (June 30, 2026); Gilly, Abstract & sec. I.

PART II · COVERAGE

No Ceiling

The statute regulates a ratio and has no authority over the total. The coverage gate is a fraction with households in the denominator, so **a machine no household uses produces no quotient at all.**

PART III · DISCLOSURE

No Denominator

Google publishes watt-hours per prompt and withholds the prompt count. **The same epistemic move as the statute, arrived at independently.** The convergence is the finding.

PART IV · ALLOCATION

No Exit

Compute is financed by risk capital whose holders bear their losses; the grid by a rate base **residential customers cannot leave.** It survives demand arriving on schedule.

Three appearances of one structural gap between the ratio the law can see and the total it cannot.

Sources Gilly, sec. I.B (The Argument in Three Clauses); 42 U.S.C. §§ 6292(b)(1)(B), 6295(l)(1).

No Ceiling

Fifty years of floors on efficiency, and not one line for the total

The best evidence that the household denominator does real work is what happened when the Department went looking for the data center in 2013.

Every metric in the statute attaches to a unit. None attaches to the aggregate.

The program sets floors on efficiency and, in some standards, caps on the rated energy use of **a single unit** under an assumed duty cycle, measured over "a representative average use cycle or period of use." The Secretary may not prescribe a standard that raises "the maximum allowable energy use" or lowers "the minimum required energy efficiency" of a covered product.

THE MISSING AUTHORITY

Nowhere does EPCA set, or authorize the Secretary to set, a limit on **how much energy a class of machines may consume in the aggregate.** The ratio-total distinction was invisible for fifty years because the two moved together.

Sources 42 U.S.C. §§ 6295(o)(1)–(2), 6295(r), 6293, 6313(a)(6); 2026 Process Rule NOPR, 91 Fed. Reg. 42,034 (proposed July 7, 2026); Gilly, sec. II.A.

A machine that no household uses does not produce a small quotient. It produces no quotient.

$$\frac{\text{aggregate annual energy use of products used by households}}{\text{number of households that use them}}$$

MUST EXCEED 100 KWH · 42 U.S.C. § 6292(B)

Both terms are defined by household use, and the standard-setting gate at § 6295(l)(1) is metered the same way. **A data center rack contributes to neither the numerator nor the denominator.** The statute cannot compute the quantity it requires itself to find, so the fastest-growing electrical load in the country is invisible to it by construction, not by oversight.

Sources 42 U.S.C. §§ 6292(b)(1)(B), 6292(b)(2)(A), 6295(l)(1); Gilly, sec. II.B.

To find the data center, the statute made the Department ask how much electricity a server draws in somebody's house.

In July 2013 the Department proposed to cover servers under Part A, the **consumer** program, the only door it chose to use. That required finding average annual per-household server use likely to exceed 100 kWh, so it "calculated average household energy use for computer systems… under the assumption that computer systems contain at least one computer or server," found individual servers draw roughly 1,900 to 2,100 kWh/yr, and cleared the bar.

AN ANSWER NO ONE COULD USE

Industry objected that the agency lacked authority over the commercial units. The Department **withdrew the determination in 2014, and no coverage determination for servers exists today.** The racks in the data centers were never in the calculation at all.

Sources 78 Fed. Reg. 41,868 (July 12, 2013); Computer Systems Proposal, 79 Fed. Reg. 11,345 (Feb. 28, 2014); 79 Fed. Reg. 11,350 (withdrawal); 42 U.S.C. § 6292(b); Gilly, sec. II.D.

Federal law sets a floor on the machine that removes the heat, and no floor on the machines that make it.

Computer room air conditioners are covered equipment, regulated at 10 C.F.R. § 431.97, with every unit made on or after May 28, 2024 meeting a minimum. **The cooler is regulated; the servers it cools are not.** The obvious observation is available to anyone, and it is not the point.

THE POINT IS HOW IT GOT THERE

Congress never named computer room air conditioners. The Department built the category from a 1978 residual definition, establishing "additional categories… which EPCA did not expressly identify." **The same interpretive move is available for the server. The Department declined to make it.**

Sources 10 C.F.R. § 431.97 (2026); CRAC Standards Rule, 88 Fed. Reg. 36,392 (June 2, 2023); 84 Fed. Reg. 48,006 (Sept. 11, 2019); 42 U.S.C. § 6311(8); Gilly, sec. II.E.

The industrial-equipment door has no numeric lock, and it is open.

Under § 6312(b) a server is "industrial equipment" on the face of the definition: it consumes energy in operation and is distributed for commercial use. To cover it the Secretary need only find doing so "necessary to carry out the purposes of this part," conserving "the energy resources of the Nation." **No kilowatt-hour figure to clear, no household to divide by, no aggregate threshold.**

WHY THE QUESTION SURVIVES JULY 2026

The determination still faces the ordinary constraints, a non-burdensome test procedure, a standard feasible and economically justified against the seven factors, substantial-evidence review. **The pending process rulemaking governs analytic method, not the coverage gate.**

Sources 42 U.S.C. §§ 6311(2)(A), 6312(a)–(b), 6313(a)(6), 6314(a)(2); 2026 Process Rule NOPR, 91 Fed. Reg. 42,034; 91 Fed. Reg. 41,578 (July 7, 2026); Gilly, secs. II.F–G.

No Denominator

The firm publishes the quotient and withholds the divisor. The convergence is the finding.

The aggregate is not merely unregulated. It is uncomputable by anyone outside the firms.

The same prompt, same hardware, same month: either 0.10 or 0.24 watt-hours, depending on what you count.

0.10
Wh, narrow convention: accelerators only

0.24
Wh, comprehensive: host, idle, overhead

Google published the first production per-prompt measurement, and it earns credit: the comprehensive figure cuts against the firm's interest. But a per-prompt figure is a **quotient**, and Google withholds the divisor. Its chief scientist, on the record: *"We're not comfortable revealing that for various reasons,"* because the firm wants users "thinking about the energy usage per prompt." In 2022 the same team reported ML "held steady at under 15%" of a denominator that has since roughly tripled.

Sources Google AI Scale (2025); AI Inference Blog (Aug. 21, 2025); Crownhart, MIT Tech. Rev. (Aug. 28, 2025); Patterson et al., 55 Computer 18 (2022); Gilly, sec. III.A.

No model-specific energy data since 2020. Into the vacuum, an outside estimate with no denominator to stand on.

OpenAI has released nothing model-specific since GPT-3; its CEO posted 0.34 Wh per query, unattached to any model. An outside lab estimated a GPT-5 response at **18.35 Wh on average and up to 40**, against 2.12 for GPT-4, from response times and assumed hardware. The 18-to-40 spread is "measurement doing what measurement does when the thing measured will not describe itself."

A TOTAL BUILT ON A BORROWED DIVISOR

Needing a denominator and having none, the analysts multiplied by 2.5 billion daily requests, **a figure from press reports, not OpenAI**, reaching roughly 45 GWh per day, the daily electricity of about 1.5 million U.S. homes.

Sources Computing (2025); Morales, Tom's Hardware (Aug. 14, 2025); DigiTimes (Aug. 15, 2025); CBS News (Aug. 21, 2025); Gilly, sec. III.B.

A statute from 1975 and a firm from 2025 built the same blind spot from opposite directions.

THE STATUTE ASKS

"What does one machine draw per household per year?" It publishes floors on that quantity, and has **no line anywhere for the total.**

THE FIRM ASKS

"What does one prompt draw?" It publishes that quantity, and **withholds the count that would yield the total.**

A ratio is what an institution reports when it wants credit for improvement without accountability for scale, and efficiency is the only environmental progress compatible with unbounded growth.

Sources 42 U.S.C. § 6292(b)(2)(A); Google AI Scale (2025); Gilly, sec. III.D.

No Exit

Compute is financed by risk capital. The grid is financed by a rate base no household can leave.

Not a prediction that the buildout will fail. It survives demand arriving exactly on schedule, which is why it is the right distinction.

In the fiber crash, the party that made the bet and the party that held the ticket were the same party.

The energy literature invokes 1990s fiber as a forecasting error. This Article draws nothing from the forecast, only from the financing. Carriers laid ~80 million miles of fiber on debt, and most sat dark for years. **The overbuilding lesson is unavailable here:** racks run at saturation, lead times are long, there is no evident dark capacity, and demand is arriving.

WHAT SPLITS THIS TIME

Then, carriers borrowed, built, and absorbed the loss themselves. Now the bet and the ticket come apart: **compute rides risk capital that bears its own losses; the grid rides a rate base households cannot leave.**

Sources Perez, Technological Revolutions and Financial Capital (2002); Koomey & Masanet, 5 Joule 1625 (2021); Runkevicius, Forbes (Mar. 24, 2025); Hayes, ISE Mag. (July 24, 2025); Gilly, sec. IV.A.

> *FERC "is not authorized to approve a pricing scheme that requires a group of utilities to pay for facilities from which its members derive no benefits, or benefits that are trivial in relation to the costs sought to be shifted."*
>
> Ill. Commerce Comm'n v. FERC, 576 F.3d 470, 476 (7th Cir. 2009) (Posner, J.)

The inquiry is comparative and about **allocation, not merit**: a facility can be enormously valuable and still be misallocated. And "benefit" is a technical term, load flows and reliability, which is where the industry's move lives.

Stated modestly: no rate design is proposed and no allocation is called unlawful. But when a load is invisible, unbounded, and unquantifiable from public disclosure, **the allocation question cannot be answered by anyone outside the firms, because the inputs are held by the firms.**

Sources Ill. Commerce Comm'n v. FERC, 576 F.3d 470 (7th Cir. 2009); Old Dominion Elec. Coop. v. FERC, 898 F.3d 1254 (D.C. Cir. 2018); S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41 (D.C. Cir. 2014); Martin & Peskoe, Harvard ELI (Mar. 2025); Gilly, secs. IV.B–C.

A state metered the load directly, and the thing EPCA cannot see became visible in one session.

$0.011

per kWh on all electricity consumed at each Virginia data center, utility-supplied and self-generated alike.

CAP $600M/YR · SUNSETS JUNE 30, 2028

Signed June 30, 2026, effective the next day, in the largest data center market in the country, where no state had taxed data center electricity before. The decisive feature: **the gate is load.** Where EPCA meters by a household fraction a data center can never satisfy, Virginia meters by the kilowatt-hour actually drawn, and the load becomes visible the moment the unit is the thing you want to limit.

Sources H.B. 30, 2026 Gen. Assemb., Spec. Sess. I, item 3-5.24 (Va. 2026); Nowak et al., Williams Mullen (July 2026); Giorno, Norman & Larreal, NOTUS (July 1, 2026); Gilly, sec. IV.D.

The Honest Version

Any version that suppressed these facts would be the version the industry would prefer to answer

The claim is jurisdictional and structural. It survives every concession, and the objections land on a discipline that cannot fix it.

Five concessions, stated plainly. The jurisdictional claim survives every one.

1 **The racks are full.** Built capacity runs at saturation and accelerator lead times are long. No evident dark capacity.

2 **Training burns power unwatched.** By design, and it sits outside Google's per-prompt accounting by that paper's own terms.

3 **Most load is not AI.** A majority of data center load is conventional cloud computing, not AI inference.

4 **Households don't pay the electrons.** Residential customers pay for shared infrastructure, capacity, and commodity.

5 **The doctrine tolerates crude matching.** Where precision is unavailable, "if crude is all that is possible, it will have to suffice," and network benefit is presumed.

> *The claim is not that AI will break the grid or that current rates are unlawful. It is that the load is invisible, unbounded, and unquantifiable, and every concession leaves that intact.*

Sources Ill. Commerce Comm'n v. FERC, 721 F.3d 764 (7th Cir. 2013); Masanet, Recalibrating, 367 Science 984 (2020); Koomey & Masanet, 5 Joule 1625 (2021); Google AI Scale (2025); Gilly, sec. V.

DECOUPLING

"Efficiency already absorbed demand." It held until it did not: **Google's own +37% year is the break**, and the coverage gap does not depend on the total rising.

PLATEAU

"ML footprint will plateau then shrink." **The same authors' firm reported its largest load growth in history** four years later.

OVERESTIMATION

"Extrapolation error, like the 1990s." Accepted and not triggered: the fiber episode is used **for its financing structure, not its forecast.**

REBOUND

"Warmed-over Jevons." Set every elasticity to zero and Part II is unchanged: **a gate cannot be satisfied by a machine no household owns.**

A reader who files this Article under rebound has filed it under the discipline that cannot fix it.

Sources Shehabi et al., 13 Env't Rsch. Letters 124030 (2018); Masanet et al., 367 Science 984 (2020); Patterson et al., 55 Computer 18 (2022); Sorrell, 37 Energy Pol'y 1456 (2009); Gilly, sec. VI.

The statute makes machines better. It was never given a provision that makes the country use less.

"Both numbers are true. The statute can read one of them. The mechanism is a fraction." The machines running the country's fastest-growing load are in no household, and contribute to neither term. The commercial door, which has no numeric lock, remains open.

No ceiling, no denominator, no exit. One structural gap between the ratio the law can see and the total it cannot, and a state has already shown that metering the load directly closes it.

Real Safety AI Foundation
t.gilly@ai-literacy-labs.org

BNP Paribas Energy Trading GP v. FERC, 743 F.3d 264 (D.C. Cir. 2014).

Ill. Commerce Comm'n v. FERC, 721 F.3d 764 (7th Cir. 2013).

Long Island Power Auth. v. FERC, 27 F.4th 705 (D.C. Cir. 2022).

Michigan v. EPA, 576 U.S. 743 (2015).

S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41 (D.C. Cir. 2014) (per curiam).

Ill. Commerce Comm'n v. FERC, 576 F.3d 470 (7th Cir. 2009).

Ill. Commerce Comm'n v. FERC, 756 F.3d 556 (7th Cir. 2014).

Loper Bright Enters. v. Raimondo, 603 U.S. 369 (2024).

Old Dominion Elec. Coop. v. FERC, 898 F.3d 1254 (D.C. Cir. 2018).

Transcontinental Gas Pipe Line Corp., 112 F.E.R.C. ¶ 61,170 (2005).

Energy Policy and Conservation Act, Pub. L. No. 94-163, 89 Stat. 871 (1975) (codified as amended at 42 U.S.C. §§ 6291–6317).

Pub. L. No. 119-8 (2025).

42 U.S.C. § 6292(a)–(b).

42 U.S.C. § 6295(l), (o), (r).

42 U.S.C. § 6311(1), (2)(A), (8).

42 U.S.C. § 6313(a)(6).

42 U.S.C. § 6316(a).

10 C.F.R. § 431.97 (2026).

Exec. Order No. 14,154, 90 Fed. Reg. 8353 (Jan. 29, 2025).

S.B. 253, 2026 Gen. Assemb., Reg. Sess. (Va. 2026); H.B. 1393 (Va. 2026).

AHRI Standard 1360-2022; ASHRAE Standard 90.1-2019.

National Energy Conservation Policy Act, Pub. L. No. 95-619, tit. IV, § 441(a) (1978).

42 U.S.C. § 6291.

42 U.S.C. § 6293.

42 U.S.C. § 6306(b)(2).

42 U.S.C. § 6312(a)–(b).

42 U.S.C. § 6314(a)(2).

10 C.F.R. § 431.92 (2026).

10 C.F.R. pts. 430–431 (2026).

H.B. 30, 2026 Gen. Assemb., Spec. Sess. I, item 3-5.24 (Va. 2026) (enacted).

Va. Code Ann. § 58.1-647.

Energy Conservation Program: Procedures, Interpretations, and Policies for Consideration of New or Revised Energy Conservation Standards, 91 Fed. Reg. 42,034 (proposed July 7, 2026) (2026 Process Rule NOPR).

Proposed Determination of Computer Servers as a Covered Consumer Product, 78 Fed. Reg. 41,868 (proposed July 12, 2013).

Proposed Determination of Computer Servers as a Covered Consumer Product, 79 Fed. Reg. 11,350 (proposed Feb. 28, 2014) (withdrawal).

Energy Conservation Standards for Uninterruptible Power Supplies, 85 Fed. Reg. 1447 (Jan. 10, 2020).

Energy Conservation Standards for Computer Room Air Conditioners and Dedicated Outdoor Air Systems, 84 Fed. Reg. 48,006 (proposed Sept. 11, 2019).

Energy Conservation Program: Review of DOE's Analytic Methods for Setting Energy Conservation Standards, 91 Fed. Reg. 41,578 (July 7, 2026).

Proposed Determination of Computer and Battery Backup Systems as a Covered Consumer Product, 79 Fed. Reg. 11,345 (proposed Feb. 28, 2014) (Computer Systems Proposal).

79 Fed. Reg. 41,656 (July 17, 2014).

Energy Conservation Standards for Computer Room Air Conditioners, 88 Fed. Reg. 36,392 (June 2, 2023) (CRAC Standards Rule).

90 Fed. Reg. 43,371 (Sept. 9, 2025).

Stephen R. Barley, Work and Technological Change (2020).

Joshua C. Gellers, Emerging Technologies and Earth System Governance in the Anthropocene, 14 Earth Sys. Governance 100157 (2022).

W. Stanley Jevons, The Coal Question (1865).

J. Daniel Khazzoom, Energy Saving Resulting from the Adoption of More Efficient Appliances, 8 Energy J. 85 (1987).

Jonathan Koomey & Eric Masanet, Does Not Compute: Avoiding Pitfalls Assessing the Internet's Energy and Carbon Impacts, 5 Joule 1625 (2021).

Alexandra Sasha Luccioni, Yacine Jernite & Emma Strubell, Power Hungry Processing: Watts Driving the Cost of AI Deployment?, in Proc. 2024 ACM FAccT 85 (2024).

Sasha Luccioni, Boris Gamazaychikov, Theo Alves da Costa & Emma Strubell, Misinformation by Omission (2025) (unpublished manuscript).

Eric Masanet et al., Recalibrating Global Data Center Energy-Use Estimates, 367 Science 984 (2020).

David Patterson et al., The Carbon Footprint of Machine Learning Training Will Plateau, Then Shrink, 55 Computer 18 (2022).

Henrik Skaug Sætra, A Framework for Evaluating and Disclosing the ESG Related Impacts of AI with the SDGs, 13 Sustainability 8503 (2021).

Henrik Skaug Sætra, AI for the Sustainable Development Goals (2022).

Arman Shehabi et al., Data Center Growth in the United States: Decoupling the Demand for Services from Electricity Use, 13 Env't Rsch. Letters 124030 (2018).

Emma Strubell, Ananya Ganesh & Andrew McCallum, Energy and Policy Considerations for Deep Learning in NLP, in Proc. 57th ACL 3645 (2019).

Peter Dauvergne, Is Artificial Intelligence Greening Global Supply Chains?, 29 Rev. Int'l Pol. Econ. 696 (2022).

Lorna A. Greening, David L. Greene & Carmen Difiglio, Energy Efficiency and Consumption: The Rebound Effect, a Survey, 28 Energy Pol'y 389 (2000).

J. Daniel Khazzoom, Economic Implications of Mandated Efficiency in Standards for Household Appliances, 1 Energy J. 21 (1980).

J. Daniel Khazzoom, Energy Savings from More Efficient Appliances: A Rejoinder, 10 Energy J. 157 (1989).

Amory B. Lovins, Energy Saving Resulting from the Adoption of More Efficient Appliances: Another View, 9 Energy J. 155 (1988).

Alexandra Sasha Luccioni, Emma Strubell & Kate Crawford, From Efficiency Gains to Rebound Effects: The Problem of Jevons' Paradox in AI's Polarized Environmental Debate, in Proc. 2025 ACM FAccT 76 (2025).

Eliza Martin & Ari Peskoe, Extracting Profits from the Public (Harv. Elec. L. Initiative, Mar. 2025).

Eric Masanet, Nuoa Lei & Jonathan Koomey, To Better Understand AI's Growing Energy Use, Analysts Need a Data Revolution, 8 Joule 2427 (2024).

Carlota Perez, Technological Revolutions and Financial Capital (2002).

Henrik Skaug Sætra, The AI ESG Protocol, 31 Sustainable Dev. 1027 (2023).

Harry D. Saunders, The Khazzoom-Brookes Postulate and Neoclassical Growth, 13 Energy J. 131 (1992).

Steve Sorrell, Jevons' Paradox Revisited, 37 Energy Pol'y 1456 (2009).

Irene Vogelaar, Sustainable AI: The Energy-Accuracy Trade-Off in the Artificial Intelligence Act (2025).

Google, Measuring the Environmental Impact of Delivering AI at Google Scale (2025) (Google AI Scale).

Read Google's 2026 Environmental Report, Google Blog (June 30, 2026).

Casey Crownhart, Google's Still Not Giving Us the Full Picture on AI Energy Use, MIT Tech. Rev. (Aug. 28, 2025).

Jowi Morales, ChatGPT 5 Power Consumption Could Be as Much as Eight Times Higher Than GPT 4, Tom's Hardware (Aug. 14, 2025).

OpenAI's Lack of Transparency on GPT-5 Energy Needs Sparks Concern, Computing (2025).

Google Reveals How Much Energy a Single AI Prompt Uses, EnergySage (Aug. 25, 2025).

Bradley J. Nowak et al., Virginia Budget Creates New Electricity Consumption Tax for Data Centers, Williams Mullen (July 2026).

Virginia's New Data Center Electricity Rate Class, Am. Action F. (Apr. 22, 2026).

Dan Runkevicius, Is the AI Boom Headed for Its "Dark Fiber" Moment?, Forbes (Mar. 24, 2025).

Logan Kugler, Dark Fiber Is Lighting Up, Comm. ACM (2014).

Measuring the Environmental Impact of AI Inference, Google Cloud Blog (Aug. 21, 2025) (AI Inference Blog).

Heather Clancy, Google's AI Expansion Weighs Heavily on Climate Goals, Trellis (June 30, 2026).

Georgia Butler, Google: Median Gemini Prompt Uses 0.24 Watt Hours of Power..., Data Ctr. Dynamics (Aug. 22, 2025).

OpenAI Flagship: Performance, Cost, Electricity, DigiTimes (Aug. 15, 2025).

What's the Environmental Cost of an AI Text Prompt? Google Says It Has an Answer, CBS News (Aug. 21, 2025).

AI Efficiency: A Gemini Reality Check, Greenly (Sept. 29, 2025).

Taylor Giorno, Zara Norman & Samuel Larreal, "The Battle Line Has Been Drawn" Around Virginia's Data Centers, NOTUS (July 1, 2026).

Virginia Leads the Way on Energy Affordability in 2026, Nat'l Caucus of Env't Legislators (Apr. 2, 2026).

Jim Hayes, The Perils of Irrational Exuberance: The 25th Anniversary of the Dot-Com Boom, ISE Mag. (July 24, 2025).

Stuart D. Kaplow, Rollback of Federal Appliance Efficiency Standards Happening (2025).