HUMAN ON A BICYCLE

ORGANIC COMPUTE INFRASTRUCTURE

Biological Compute at Scale

Thermodynamics, Unit Economics and Why We Did Not Think This Through

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AI has an energy problem. Humans have legs.

ABSTRACT

Human on a Bicycle operates an organic compute network in which AI workloads are powered by humans pedaling stationary bicycles. This report models the full conversion chain from dietary energy to token output, describes scheduling under biological fatigue, and presents the complete thermodynamic and economic profile of the system. The physics is real, the arithmetic is disclosed, and the conclusion is unavoidable. Readers evaluating a deployment are encouraged to read Section 7 first.

1. Biological power generation

A healthy adult can sustain roughly 75 to 150 watts of mechanical output for extended periods, and trained cyclists sustain considerably more for an hour (Wilson, Bicycling Science). We standardize on a conservative 100 watts of sustained mechanical output per active rider.

The bicycle is central to the architecture. Under the cost-of-transport measure used by Tucker (1970) and extended by Wilson (1973), a walking human consumes approximately 0.75 calories per gram per kilometer while a cycling human consumes approximately 0.15, roughly five times lower. This is why our riders sit on bicycles and not, for example, treadmills.

2. Human-to-electrical conversion

Measured gross efficiency in trained cyclists typically falls between roughly 18 and 23 percent (PubMed, PMID 8933490). We model 20 percent. Of the dietary energy a rider metabolizes, one fifth becomes mechanical work at the pedal. The generator and power electronics then convert mechanical work to direct current at a modeled 80 percent.

$$P_e = P_m \times \eta$$

$P_m = 100$ W · $\eta = 0.80$ · $P_e = 80$ W

End to end, approximately 16 percent of dietary energy reaches the DC bus. A rider metabolizing 500 watts delivers 100 watts of mechanical power and 80 watts of electricity. The remaining 420 watts is released as heat, a figure Section 5 will come to regret.

Required active riders for a given load follow directly:

$$N = P_{load} / P_e$$

For a 1 MW load: N = 1,000,000 W / 80 W = 12,500 riders

3. Workload scheduling around fatigue

Human power output is not stationary. Critical-power models (Monod and Scherrer, 1965) describe a sustainable threshold plus a finite work capacity above it. Our Human Powertrain Scheduler treats each rider as a stateful power source with a depleting anaerobic buffer, and treats human fatigue as an infrastructure constraint.

Migration policies watch for cadence droop, heart-rate ceilings, and localized quadriceps failure. When a rack shows elevated fatigue, workloads shift to regions where riders are fresher, which in practice means Denmark. Batch jobs are queued against recovery windows; latency-sensitive inference is pinned to riders in Zone 2.

4. Nutritional supply chains

At 20 percent gross efficiency, delivering one megawatt-hour of electricity requires riders to metabolize approximately 6.25 megawatt-hours of food energy, about 5.4 million dietary calories. Using the common figure of 105 calories per medium banana, a 1 MW facility consumes the equivalent of roughly 51,000 bananas per hour, about 6 tonnes, or approximately 147 tonnes per day of continuous operation. This is a supply-chain problem normally associated with grocery chains rather than cloud providers.

Food production also carries its own substantial upstream energy and carbon footprint, which a complete system boundary cannot exclude. Biological compute does not remove energy inputs; it reroutes them through agriculture, which is not known for its power-usage effectiveness.

5. Cooling 100,000 cyclists

Each rider delivering 100 watts of mechanical power dissipates roughly 400 watts of heat. A 100,000-rider deployment therefore produces approximately 40 megawatts of sensible heat before a single GPU is counted. At a modeled 0.8 liters of sweat per rider-hour, the facility also emits up to 80,000 liters of perspiration per hour; if fully evaporated, the latent load alone approaches 50 megawatts.

The same 100,000 riders generate 8 megawatts of electricity. The facility thus produces roughly ninety megawatts of combined thermal load in exchange for eight megawatts of usable power, a ratio conventional data-center engineering does not typically consider favorable. Conventional facilities manage sensible heat; ours also manages latent heat, humidity, odor, and morale.

6. Labor economics

A rider producing 80 watts for one hour delivers 0.08 kilowatt-hours. At $15 per hour of compensation:

$$C_{labor} = \text{hourly compensation} / \text{hourly rider output}$$

Clabor = $15 / 0.08 kWh = $187.50 per kWh

Against an example retail electricity rate of $0.20 per kilowatt-hour, labor alone runs approximately 938 times the cost of grid energy. This excludes food, rent, bicycles, maintenance, storage, cooling, showers, towels, insurance, and the compute hardware itself.

Sensitivity analysis does not rescue the model. An elite rider sustaining 300 watts of net electrical output at the same wage still costs $50 per kilowatt-hour, roughly 250 times the example grid rate. The economics are not marginal. They are categorical.

7. The case for ordinary electricity

Grid electricity delivers energy at roughly three orders of magnitude lower cost than organic compute, with no locker rooms, no banana logistics, and no medical waivers. Our analysis therefore supports the following deployment guidance: organizations requiring compute should buy electricity; organizations requiring exercise should buy bicycles. The intersection of the two is a wellness program, not an infrastructure company.

We nonetheless remain open for business.

Disclosed model assumptions

- 100 W mechanical output per active rider
- 80% generator and power-electronics conversion
- 80 W net electrical output per rider
- 20% gross muscular efficiency for the food-energy model
- 105 dietary calories per medium banana
- 0.8 liters of sweat per rider-hour

- 24 stations per HR-24 rack

References

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Human on a Bicycle is a satirical project about AI, energy, and our apparently limitless ability to build infrastructure startups. No commercial compute is currently powered by cyclists. The equations, efficiencies, and citations above are real.