Comment

Supplementary information to:

Net zero needs AI — five actions to realize its promise

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Supplementary Materials *to Nature Comment: Luers, A. No Net Zero without AI*

How does energy use by ChatGPT compare with other activities?
The energy use for ChatGPT queries depends on the length and complexity of the query, the model version (eg. GPT-3.5 vs GPT-4o) and the infrastructure used to run the model (eg. Chips – GPU and TPU types). As a result, perfectly comparable estimates are difficult to obtain. Here, I compare a range of recent estimates.

Jegham et al. (2025) report an average of 0.43 Wh per GPT-4 query, while You (2025) estimates 0.3 Wh for a "typical" ChatGPT query (<100 word), and 3.5 Wh for a relatively "long" query (>7,000 word). The Hugging Face AI Energy Score project (2025) reports an average of ~290 Wh per 1,000 text generation tasks, or roughly ~0.3 Wh for each text generation task, across a range of open-source models of various sizes. (As reported by Chen 2025 in *Nature*)
Here, two scenarios are presented to illustrate the potential range of ChatGPT's daily electricity use, based on OpenAI's recent report that the system currently handles approximately 2.5 billion queries per day (Open AI 2025).

- **Typical Query Scenario** (0.4 Wh/query):
  0.4 Wh × 2.5 billion queries = **1 gigawatt-hour (GWh)** per day
- **Long Query Scenario** (3.5 Wh/query):
  3.5 Wh × 2.5 billion queries = **8.75 GWh** per day

These values are notably smaller than estimates from just a couple of years ago. For example, de Vries (2023) calculated that the average ChatGPT query consumed about 2.9 Wh —roughly ten times the energy of a Google search at the time—based on analyses of GPT-3.5–era models running on A100 GPUs (e.g., de Vries, 2023). Although his figure is still widely cited in media and policy commentary, it reflects older model architectures and outdated assumptions about hardware efficiency.

Energy used by US Televisions
For comparison, consider the electrical energy consumed by televisions. In a typical household in the United States, television use accounts for 5.8% of the total household electricity consumption of about 10.5 megawatt-hours per year (US Energy Information Administration, 2025). That means that, on a daily basis, the typical US household uses 28.7 kilowatt-hours of electricity, of which 1.67 kilowatt-hours is used for powering televisions. Multiplying that by the number of households in the United States, 132 million (US Census, 2024), we arrive at an estimate of 220 gigawatt-hours of electricity consumed by televisions every day in just the United States. This is 220 times more than the electricity used by ChatGPT responding to queries from across the globe. Or put another way,

the energy used by ChatGPT to respond to queries around that world in one day is equivalent to less than 0.5 % of the energy used to power television watching in the US in a day.

How does water use by ChatGPT queries compare with other activities?
Water is consumed by ChatGPT directly through cooling of server facilities and indirectly in cooling of thermoelectric power plants that provide electricity. Together, these processes have been estimated to consume 3.69 liters for every kilowatt-hour of electrical energy used by ChatGPT (Li et al., 2025), which is equivalent to 3,690 cubic meters per gigawatt-hour. If we multiply that rate of water consumption by 1 gigawatt-hour—the daily electrical energy use of typical ChatGPT queries calculated above—we obtain an estimate of 3,690 m^3 of water consumed in responding to the 2.5 billion queries each day from around the world.

Water used to power television
For comparison, consider water consumed in generating the electricity that powers televisions in the US. On average, electricity generation in the US consumes about 3.14 liters per kilowatt-hour, or 3,140 cubic meters per gigawatt-hour (Li et al., 2025). Multiplying that value by the 220 gigawatt-hours of energy consumed daily by *televisions results in 690,000 cubic meters*, more than 180 times the water consumed by ChatGPT. Or put another way, the water consumed directly by data centers and indirectly by the water consumed to generate the electricity that powers ChatGPT is about 0.5% of the water consumed to power television watching in the US in a day.

Water lost by leaking pipes
Another interesting comparison is the water lost from municipal water systems due to leaky pipes. Referred to as 'non-revenue water', this is water that is lost from the system before reaching household water meters and thus does not generate revenue for water supply agencies (Liemberger and Wyatt, 2019). For the US, estimates of non-revenue water range from 40 to 47 million cubic meters per day, more than 10,000 times larger than ChatGPT's water footprint.

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