Data Centers & The AI Revolution

Where your answers actually come from — and what it costs

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KEY DEFINITIONS

Data Center
A large building full of powerful computers. Think of it as a factory — but instead of making products, it manufactures answers.

Training
Teaching the AI. It reads billions of documents. Happens once, takes months, costs hundreds of millions.

Megawatt / Gigawatt
Units of electrical power. One large data center can draw as much as a small city.

GPU
The specialized chip inside that does the math — billions of calculations every second.

Inference
Using the AI. Every question you ask. Happens billions of times a day, and never stops.

TVA
The Tennessee Valley Authority — the federal utility that powers nearly all of Tennessee, homes and data centers alike.

THE ONE IDEA TO TAKE HOME

> **Training is going to school. Inference is going to work every day for the rest of your life.**
>
> School ends. Work doesn't. That is why the buildout never seems to stop.

TRAINING

Building the brain

- Happens once, or occasionally
- Takes months
- Costs tens to hundreds of millions
- Finite — then it's done

INFERENCE

Using the brain

- Every single question, every user
- Billions of times a day
- Runs continuously, forever
- Grows as more people use it

Today the split is roughly even. **By 2029, inference is projected to be 65–90% of all AI computing.** The new buildings going up are not about making AI smarter — they are about answering the questions we already ask.

WHY SO MUCH ELECTRICITY — AND SO MUCH COOLING

- Every calculation takes electricity, and the chips run billions of them per second.
- All that electricity turns into **heat**. Chips fail or slow down if they overheat.
- So cooling runs constantly — water, air and specialized fluids — and **cooling alone accounts for 30–40%** of a data center's total energy use.

Your laptop gets warm running a video. Now picture a million laptops in one building, all at full speed, all day, forever.

WHAT IS DRIVING THE GROWTH: FROM SEARCHING TO DOING

Most of us still use AI the way we used Google — ask, answer, done. That is relatively light work. The growth is coming from AI that *does things*:

- **Email** — drafting and sending thousands of customer messages automatically
- **Scheduling** — managing calendars and resolving conflicts across whole organizations
- **Marketing** — writing proposals and brochures tailored to each customer
- **Training videos** — narrated instructional videos, with no film crew

Beyond that sits the real driver: **AI systems that direct other AI systems.** One agent calls ten others; each of those calls ten more — at machine speed, continuously.

MAKING IT REAL: MEDICINE

A drug company hunting a cure for Alzheimer's today needs **10+ years** of laboratory work. With AI agents working together:

- One agent analyzes millions of molecular compounds for candidates
- Another runs safety simulations on the most promising ones
- A third predicts how the human body would process each compound
- All three refine each other's work, continuously and on their own

What took ten years might take months. And closer to home: AI reading your medical history, genetics and lifestyle to predict what you are likely to develop in the next **5–10 years** — while other agents search for ways to prevent it. Catching it before it happens.

Every one of those agent conversations is inference. Every one burns electricity, around the clock.

CLOSE TO HOME: THE XAI "COLOSSUS" CENTER, SOUTH MEMPHIS

> **The same source.** Colossus and Memphis homes both draw their power from TVA.
>
> **The workaround.** When it came online, a grid bottleneck limited the site to roughly **8 megawatts** from local lines — nowhere near enough. Rather than wait years for transmission upgrades, it ran largely off-grid on dozens of portable natural gas turbines generating over **400 MW** on site.
>
> **The cost, and who paid it.** That kept residential lines from being drained — but the turbines drew serious community backlash over air quality and emissions in the surrounding South Memphis neighborhoods.
>
> **Where it stands.** The facility has since been approved to draw about **300 MW** straight from the TVA grid, with future expansion possibly reaching **1.5 to 2 gigawatts** — the power draw of a mid-sized city. High-voltage transmission upgrades isolate that load so it does not flicker the lights on residential streets.

The tension worth sitting with: engineering can separate the data center's load from your neighbor's lights. It cannot separate the air quality and disruption from the neighborhood that lives there. The benefits of AI are global. Those costs landed on one community — and this pattern is repeating nationally.

HOW WILL WE KNOW IF IT WAS NECESSARY?

Honestly: nobody knows yet. Some of this buildout is competitive panic rather than proven demand — companies racing to secure capacity before rivals do. We have overbuilt infrastructure before; the fiber optic bubble of the early 2000s is the cautionary tale.

Four things to watch over the next two to three years. You do not need to be technical — these turn up in ordinary news stories about energy prices, medical breakthroughs and local planning fights.

- Is **actual energy use** at the big operators climbing, or is capacity sitting idle?
- Are **AI agent systems** genuinely being deployed at scale in medicine, pharma and manufacturing?
- Are **efficiency gains** bringing down the energy cost of each answer?
- Are **communities getting a real seat** at the table when siting decisions are made?

QUESTIONS WORTH LEAVING WITH

1. If AI could tell you your risk of a disease ten years out — would you want to know?
2. Does the drug discovery promise feel real to you, or more hype than substance?
3. Who should decide where a data center gets built — the company, the city, or the neighborhood?
4. What is one thing you will think about differently the next time you ask a voice assistant a question?