

AI Data Centres

A data centre is a building or group of buildings that houses computer servers, networking equipment, and storage systems. It keeps those systems cooled, powered, and connected to the internet. Businesses use data centres to run their websites, store customer data, process transactions, and deliver software services.

What Makes an AI Data Centre Different? An AI data centre is optimized for one thing: running AI workloads. These workloads require a fundamentally different type of hardware. The key difference is the processor. AI workloads use GPUs (graphics processing units) or TPUs (tensor processing units). These chips perform thousands of small mathematical operations simultaneously. Training a single large AI model can require tens of thousands of GPUs running in parallel for weeks. That scale demands:

- Much higher power density per server rack (standard racks run 5–15 kW; AI racks run 30–130 kW)
- Advanced cooling systems (liquid cooling, immersion cooling, or rear-door heat exchangers)
- Ultra-fast networking (InfiniBand or 400G Ethernet to keep GPU clusters in sync)
- Custom power infrastructure (dedicated substations, on-site generation, battery storage)

Workload Types: Training vs. Inference

- **Training:** Building an AI model from scratch. This is the most compute-intensive task. It involves processing massive datasets to adjust billions of parameters until the model learns useful patterns. Training a model like GPT-4 is estimated to have required ~25,000 NVIDIA A100 GPUs running for roughly 90–100 days (SemiAnalysis, 2023).
- **Inference:** Using an already-trained model to produce outputs — answering a question, generating an image, detecting fraud. Inference is less compute-intensive per query but must handle millions of requests simultaneously. As AI adoption grows, inference demand is growing faster than training demand.

Comparison Table: AI vs. Traditional Data Centres

Feature	Traditional Data Centre	AI Data Centre
Primary processor	CPU	GPU / TPU / Custom AI ASIC
Power per rack	5–15 kW	30–130 kW
Cooling method	Primarily air-cooled	Liquid, immersion, or hybrid
Networking speed	10–100 Gbps	400 Gbps – 1.6 Tbps
Typical PUE	1.4–2.0	1.1–1.3 (best-in-class)
Workload type	Web apps, databases, storage	Model training, inference, embedding
Build cost per MW	\$5–10 million/MW	\$10–25 million/MW
Water consumption	Moderate	High (for highest-density builds)
Chip refresh cycle	5–7 years	2–3 years

SOURCES: GARTNER (2024), UPTIME INSTITUTE (2024), CBRE AI DATA CENTRE REPORT (2025).

Myths vs. Facts

Myth	Fact
"AI data centres are just bigger versions of regular server farms."	False. AI data centres use fundamentally different hardware (GPUs/TPUs), 5–10x higher power density per rack, and require specialized networking and cooling that traditional data centres cannot provide.
"Cloud providers are going 100% renewable, so AI data centres are green."	Misleading. While hyperscalers purchase renewable energy credits, actual grid power used is often still fossil-fuel-derived. Absolute electricity consumption is rising faster than renewable buildout in most regions.
"Quantum computers will replace AI data centres soon."	False. Quantum computers solve a narrow class of specific problems and cannot run neural networks. AI data centres will remain the dominant compute paradigm for at least the next decade.
"Data centres always harm local environments."	Oversimplified. When sited and designed carefully, modern data centres can use 100% renewable energy, participate in water recycling programs, and return warmed water to district heating systems (as in Stockholm and Helsinki).

Ontario Specific

Ontario has emphasized that data centres should contribute to Ontario's economy while paying electricity costs and supporting necessary infrastructure investments. The data centre framework aims to:

- Attract investment in AI and digital infrastructure
- Ensure data used by Canadian organizations remains within Canada where required
- Require developers to contribute to infrastructure needs
- Support community and economic benefits
- Integrate data-centre growth into electricity planning

Issue	Why It Matters	Ontario Evidence / Examples	Community Question
Electricity^{3,6} Demand and Grid Reliability	AI data centres operate 24/7 and require large, continuous electricity loads for computing and cooling. Growth must be balanced with existing electricity priorities.	Data centres are expected to account for approximately 13% of Ontario's new electricity demand over the next 10 years . Planned expansion could add approximately 1.5 GW of new load by 2035 .	How will Ontario ensure AI expansion does not increase electricity costs or limit access for housing, hospitals, transit electrification and industry?
Water² Use and Municipal Infrastructure	Cooling high-density computing equipment requires significant water and infrastructure. Ontario's freshwater resources are abundant but finite.	Etobicoke YTO 40: 39.75 L/s approved cooling withdrawal (~ 1.2 billion litres/year). Microsoft Vaughan: projected ~ 730 million litres/year . York Region clusters: forecast ~ 22 million litres/day .	How will communities protect water supplies during drought, population growth and increasing industrial demand?
Noise⁸ Pollution and Quality of Life	Data centres produce continuous industrial noise from cooling systems, fans, transformers and backup generators.	Ontario regulates stationary noise through NPC-300. Mississauga Prologis proposal: backup generators estimated at ~ 72 dBA at 23 feet during operation. Vaughan Microsoft identified as a stationary noise source requiring mitigation.	Why are complete noise studies and mitigation plans not publicly available before approval?
Climate and Environmental Impacts^{4,5,7}	AI growth increases electricity demand and may increase pressure for additional generation capacity, including fossil-fuel-based reliability solutions in some jurisdictions.	Data centres and data transmission networks account for approximately 3% of global carbon emissions according to IEA estimates. Large-scale cooling systems also require industrial chemicals requiring disclosure and oversight.	How will Ontario ensure AI expansion aligns with climate commitments and avoids future environmental liabilities?
Data Sovereignty and Foreign Ownership¹	Data stored in Ontario is not automatically under Canadian legal control. Ownership and corporate structure determine which laws may apply.	Many Ontario data centres are operated by foreign-owned cloud providers. The U.S. CLOUD Act and FISA may create legal pathways for access depending on circumstances.	If data is stored in Ontario but controlled by foreign companies, who ultimately controls Canadian data?
Community Benefits⁹ and Accountability	Data centres can bring investment, but communities need measurable benefits that match infrastructure demands.	Ontario's framework emphasizes investment, infrastructure contributions and community benefits, but many commitments require clear measurement and enforcement.	What benefits are legally guaranteed to host communities, and who is accountable if they are not delivered?