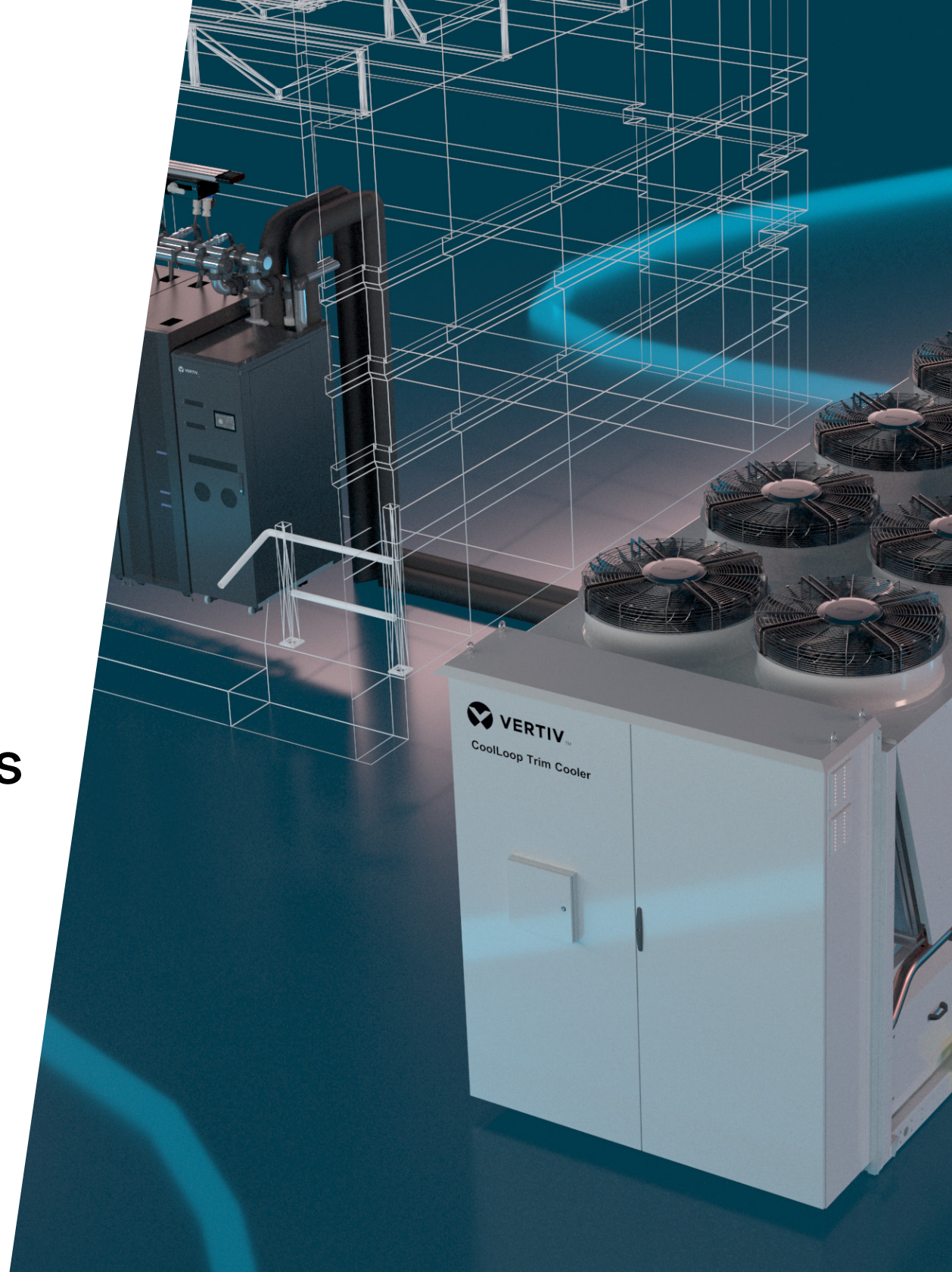




Use case

Designing for
unpredictability:
how adaptive
infrastructure
creates long-term
value in data centers



Background

When facility type no longer matters

In today's data center industry, one assumption is quickly becoming obsolete: that the facility type defines the complexity of the technology to be deployed.

Data centers are now being built everywhere, in greenfield sites, in dense urban areas, inside repurposed industrial buildings, and even in unconventional locations such as underground facilities or former mines.

The transformation of data center cooling isn't linked exclusively to the installation context, but rather reflects a complex interplay of many aspects: business growth objectives, thermal requirements, chip temperatures, geographic constraints, external ambient temperature, water availability, and long-term operational resilience.

Regardless of chip temperatures, of compressor-based or compressor-less technologies, of the location or of the external ambient temperatures, every operator is facing the same underlying issue: **unpredictability. The real challenge is not where you build, but how you design.**

Challenge

The new challenge: unpredictability at scale

The rapid growth of AI infrastructure is fundamentally reshaping data center requirements.

Power densities are increasing at a pace that outstrips traditional design assumptions. Cooling requirements are becoming more complex, and future conditions — particularly around chip temperatures and performance, thermal loads, and cooling architectures — are quickly evolving. Designing infrastructure based on fixed assumptions is no longer viable.

Systems built for today risk becoming inefficient or obsolete tomorrow. This creates a new type of challenge for operators: how to deploy capacity quickly while allowing infrastructure to remain adaptable over time.

Solution

Delivering capacity without locking future decisions

This was the exact challenge faced by a colocation data center operator serving enterprise and government clients.

The objective was clear: accelerate the deployment of a large-scale facility and bring capacity to market ahead of demand.

However, the design needed to remain flexible enough to adapt to:

- evolving AI workloads
- increasing rack densities
- the expected transition toward liquid cooling
- evolving future working temperatures and efficiency requirements

The risk was equally clear: making early design decisions that would limit scalability, reduce efficiency, or create stranded investments.

From product selection to system architecture

Rather than selecting a single cooling approach, the operator adopted a different strategy: design an adaptive infrastructure capable of evolving over time.

At the center of this architecture is the [Vertiv™ CoolLoop Trim Cooler](#), integrated within a holistic, broader thermal management scalable ecosystem.

The key shift was not the product itself, but the design philosophy: moving from a component-based approach to a system-centric architecture. This allows the infrastructure to remain flexible, capable of supporting both air and liquid cooling strategies without committing prematurely to either.



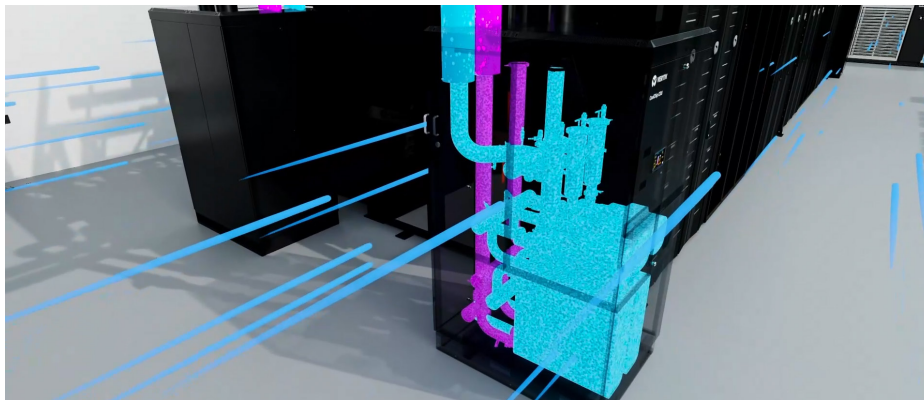
Engineering flexibility into the infrastructure

Vertiv enabled this deployment through a scalable solution featuring [Vertiv™ CoolLoop Trim Cooler](#) units and power modules to support initially 130MW capacity with the possibility to extend up to 190MW. The system was designed with a flexible hydraulic architecture, enabling seamless transition between different cooling modes as requirements evolve. Their key requirement was the ability to use the same equipment across different operating modes over time, avoiding stranded assets and maximizing return on investment.

In practical terms, the system delivers:

- Phased thermal approach: start with lower water temperatures for initial, lower-density deployments
- Adaptive temperature control: progressively increase water temperature levels and cooling capacity as densities rise
- Future-ready scalability: integrate liquid cooling technologies without replacing core infrastructure
- Maximized energy efficiency: advanced heat rejection capabilities maximize the use of free cooling, significantly improving energy efficiency while maintaining performance consistency.

This approach minimizes one of the biggest risks in data center design: locking into a fixed infrastructure that cannot evolve.



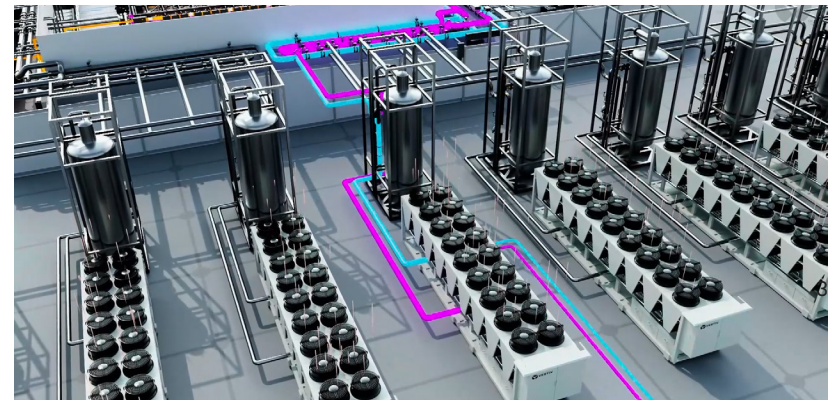
A platform approach to scalability

Beyond the cooling core, the design incorporates a fully modular ecosystem that can expand over time without disrupting operations.

This includes:

- indoor **thermal wall or CRAH** cooling configurations adaptable to different layouts and tenant requirements
- [Vertiv™ SmartRun](#), a modular converged overhead infrastructure integrating power distribution, liquid cooling pipe network, hot-aisle containment, and network cabling into a single unit, receiving chilled water from the Vertiv™ CoolLoop Trim Cooler and delivering it to the Coolant Distribution Units (CDUs) for direct-to-chip and rack-level liquid cooling
- integrated control and monitoring platforms enabling real-time optimization and predictive maintenance

Together, these elements form the foundation of [Vertiv™ OneCore](#), the fully integrated, standardized data center platform that unifies power, cooling, and infrastructure into a cohesive, scalable system. The Vertiv™ CoolLoop Trim Cooler is one of the core cooling solutions within Vertiv OneCore, purpose-built for AI factory deployments, enabling rapid commissioning and scalable expansion to 250 MW and beyond. The result is not a static infrastructure, but a **scalable platform**, one that can grow and adapt in line with business and technology requirements.





Outcome

From infrastructure to strategic asset: shifting the value equation

By adopting this modular, compact, system-based approach, the operator achieved three critical outcomes.

- First, **early infrastructure readiness**, enabling rapid onboarding of customers and faster monetization of computing capacity.
- Second, **long-term adaptability**, reducing the risk of obsolescence and allowing the infrastructure to support a wide range of evolving workloads.
- Third, **operational efficiency**, driven by optimized energy usage and scalable design.

Most importantly, the operator gained something less tangible but equally critical: confidence.

Confidence that the infrastructure will remain relevant, that investments will retain value, and that future requirements can be met without disruption.

This project highlights a fundamental shift in the data center industry. The value is no longer defined by the present site typology. It is defined by the ability to design and integrate systems that can adapt, scale, and evolve over time.

In this context, the role of a partner like Vertiv becomes critical. With chip temperatures at the technology coolant supply (TCS) potentially reaching 40–45°C, the real differentiator is not the choice of compressor-based or compressor-less technology, eliminating mechanical refrigeration compressors in favor of passive heat rejection, but the ability to orchestrate power and thermal AI infrastructure into a cohesive, flexible and scalable system.

From greenfield sites to heritage buildings and repurposed underground facilities, success is not defined by the type of data center, but by the intelligence of the system design behind it.



Vertiv's capability to design and integrate adaptive infrastructure transforms unpredictability into structure, delivering measurable value and long-term operational confidence for the customer.

"True flexibility is the ability to respond to what you cannot predict - so when a clear choice isn't possible, the system has already made the best one for you."

— Maurizio Frizziero

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