Multi Scenario Modular AIDC Solution

The Challenge of Thermal Management

Today's AI data centers face unprecedented cooling challenges. The latest GB200 GPUs generate significantly more heat than their predecessors, while rack densities continue to climb as more processing units are packed into tighter spaces to power demanding AI applications. Taking the Nvidia GB200 NVL 72 server as an example, With rack power consumption 132 kW, traditional air cooling has reached its physical limits. Air cooling simply cannot dissipate heat efficiently enough to maintain safe operating temperatures in these high-density environments. So, 75% to 80% of the heat generated by the GB200 NVL 72 rack is mainly dissipated by the cold plate liquid cooling scheme, while 20% to 25% of the heat is still cooled by the air-cooling scheme. So, the EPG demo showcases four different scenario solutions to solve this problem.

Hybrid Cooling, AC & LC Integrated Cooling Source

Liquid Cooling (directly to chip technology) has become a leading solution for artificial intelligence data centers. This method directly delivers the coolant to the heating components, effectively removing about 75% to 80% of the heat load and providing flexibility and practicality. For environments with varying density requirements, hybrid cooling AC & LC Integrated Cooling Source combines the best of both worlds. These AC & LC Integrated Cooling Source can be customized to address specific thermal zones within your data center, optimizing both performance and efficiency.

Power Supply Architecture, 2N system and DR system

The power supply architecture includes 2N power supply, DR (Distributed Redundancy) power supply, and different power supply architectures are provided in the EPG DEMO to meet the customer's AIDC design needs.

All-in-one Battery Energy Storage System (BESS)

A Battery Energy Storage- Backup Power for Cooling System is designed to provide continuous power supply for outdoor refrigeration equipment. This can replace UPS systems and cold storage tanks for chilled water storage.

Solar Photovoltaic Panel Scheme

The roofs of some container modules can be equipped with photovoltaic panels to provide power for lighting, monitoring, and other equipment inside the containers. It can effectively reduce PUE.

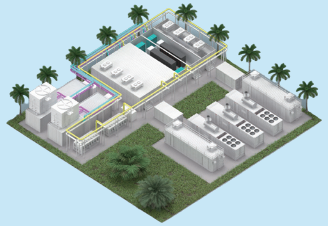
Magnetic Levitation Refrigeration System

In some scenarios, a magnetic levitation phase change refrigeration system has been designed, which has high refrigeration efficiency and is very water-saving. The indoor end air conditioning supports FWU, CRAC, In row AC, as well as CDU or direct entry into the cold plate, reducing the usage space and improving PUE.

Heat recovery module

The heat recovery module can effectively utilize the waste heat from the liquid cooled primary side and provide heating equipment for living or office areas.

Zone 1, Air Cool & LC Mixing, 2N Power Distribution, Air Cooled Chiller

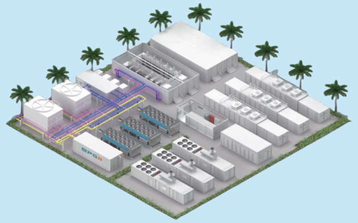


In the Zone 1 scheme, the power distribution architecture adopts a 2N architecture, with Genset being a 11KV medium voltage Genset and a 2+1 configuration, equipped with 2 MV SYNC PODs, 2 transformer PODs, and 2 LV PODs. The cooling scheme adopts a mixed scheme of liquid cooling station POD and air-cooled chilled water system. The liquid cooling station POD provides a cold source for the liquid cooling plate server, and heat exchange is carried out through the CDU in the IT POD. The air-cooled chiller unit supplies cooling to the room CRAH in the IT POD. The IT POD is assembled from 4 IT containers, and there are 16 Nvidia GB200 NVL72 server cabinets deployed internally, with a total IT load of 2MW.

Zone 2, Air Cool & LC Mixing, 2N Power Distribution, Water Cooled Chiller POD

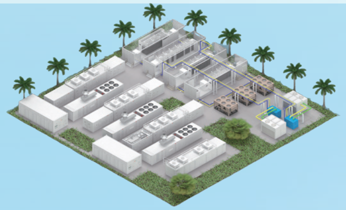
In the Zone 2 scheme, the power distribution architecture adopts a 2N architecture, with Genset being a 11KV medium voltage Genset and a 2+1 configuration. It is equipped with 2 MV SYNC PODs, 2 transformer PODs, and 2 LV PODs. The cooling scheme adopts a mixed scheme of liquid cooling station POD and water-cooled chiller station POD. The liquid cooling station PODs provide cold source for the liquid cooling plate server, and heat exchange is carried out through the CDUs in the IT POD. The water-cooled chiller station supplies cooling to the Room CRAHs air conditioning inside the IT POD. The IT POD is assembled from 4 IT containers, and there are 16 Nvidia GB200 NVL72 server cabinets deployed internally, with a total IT load of 2MW.

Zone 3, Integrated Cooling Source, DR Power Distribution, Waste Heat Recovery



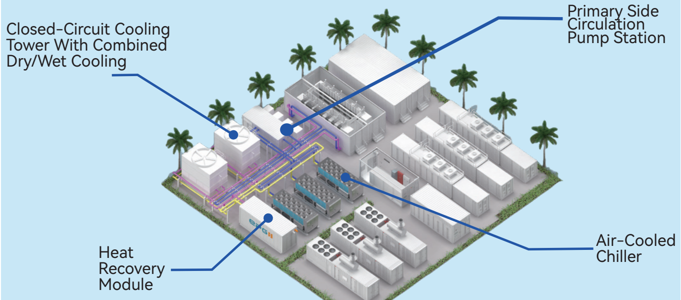
In the Zone 3 scheme, the power system adopts DR architecture, with 2 MV PODs serving as MV power A and B. Afterwards, 3 TR PODs are configured, corresponding to 3 LV PODs respectively. And 3 400V Gensets correspond to 3 LV PODs respectively. During normal operation, the load rate of each group of LV POD is 66.7%. When one group fails, the load rate of the other two LV POD increases to 100% respectively. The cooling scheme adopts a Hybrid Cooling scheme of liquid cooling station Pods, air-cooled chillers, Heat recovery POD. The chilled water is supplied to the indoor CRAH air conditioners, and then goes to the CDU to exchange heat with the liquid cooling secondary side. The IT area consists of 2 IT PODs, each POD composed of 2 containers, Each IT POD is 1MW and includes 8 Nvidia GB200 NVL 72 cabinets. The total load of the IT area is 2MW.

Zone 4, Integrated Cooling Source, DR Power Distribution, Multi End Cooling Scheme



In the Zone 4 scheme, the power system adopts DR architecture, with 2 MV PODs serving as MV power A and B. Afterwards, 3 TR PODs are configured, corresponding to 3 LV PODs respectively. And 3 400V Gensets correspond to 3 LV PODs respectively. During normal operation, the load rate of each group of LV POD is 66.7%. When one group fails, the load rate of the other two groups of LV POD increases to 100% respectively. The cooling scheme adopts a magnetic levitation phase change system, and the air cooling and liquid cooling parts are the same refrigeration system. The outdoor unit of the magnetic levitation system will provide refrigerant to the end air conditioner inside the IT POD. The end air conditioner including CDU, FWU, CRAC, In-Row AC, Thin Plate Fan Wall, Top Fan Coil etc. The IT area consists of 4 separate IT containers, and the total IT load is 2MW.

Improving the Efficiency of Liquid Cooling System



Hybrid liquid cooling technology enables expanded thermal operating ranges for chilled water, supply air, and secondary inlets, thereby maximizing infrastructure efficiency. Hot water-cooling systems are particularly advantageous in this context. The secondary inlet temperature can be elevated to 45℃, which not only achieves desired thermal management results but also creates expanded opportunities for waste heat recovery and utilization.

The control system strategically distributes return facility water through the main loop, directing it partially or entirely into heat recovery systems. Based on regional requirements or environmental conditions, organizations can implement prefabricated thermal recovery stations to effectively repurpose waste heat for heating applications.

Following heat recovery processes, facility water is directed to a closed-circuit cooling tower. By utilizing specialized closed-circuit cooling towers designed specifically for liquid-cooled systems with dry/wet hybrid cooling capabilities, water can sequentially pass through dry coil elements before entering wet coil components. This engineered flow pattern enhances thermal dissipation efficiency while simultaneously reducing water consumption.

If the cooling tower process does not sufficiently reduce water temperature to meet required supply specifications, facility water can be routed through an air-cooled chiller unit for additional refrigeration. The chilled water supply is transported to data halls via dedicated chilled pump stations.

Integrating all-in-one Battery Energy Storage Systems (BESS) with UPS functionality ensures continuous cooling operations while delivering superior electrical performance. This system achieves power factor correction to 0.95-1.0, operates in eco mode with efficiency exceeding 99.5%, and provides peak shaving capabilities with grid services readiness. The BESS-UPS configuration eliminates the need for complex thermal storage solutions while maintaining critical cooling functions during power disruptions, offering a streamlined approach that enhances both thermal and electrical infrastructure reliability and efficiency.

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DATA CENTER MODULE

2N/DR power distribution architecture, display of air-cooled chilled water and magnetic levitation phase change system solutions.

2N/DR power distribution architecture, Integrated Cooling Source, and display of liquid cooling station solutions.

Multi Scenario Modular AIDC Solution

EPG's Pre-engineering and Prefabricated
Data Center Solution