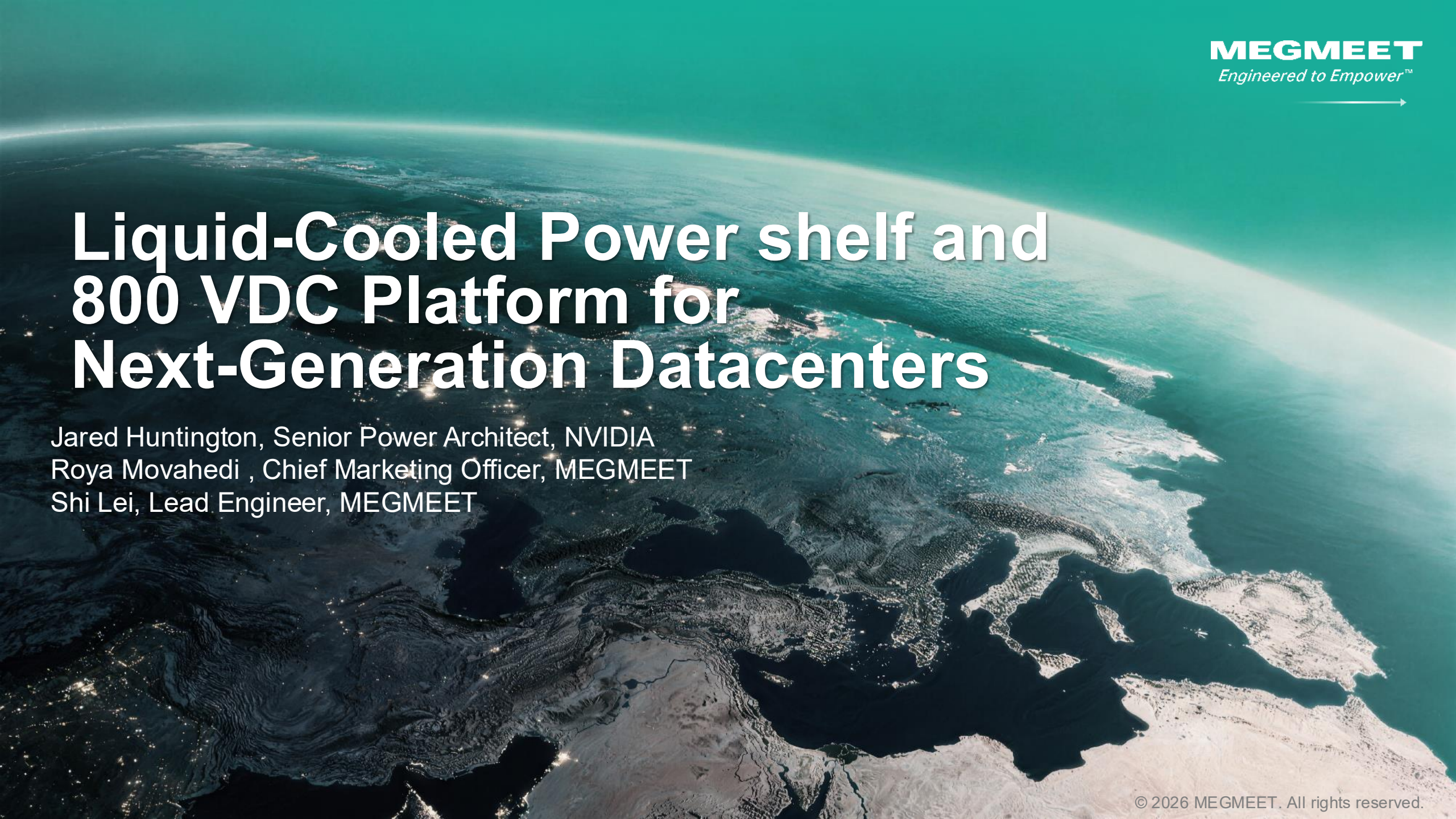
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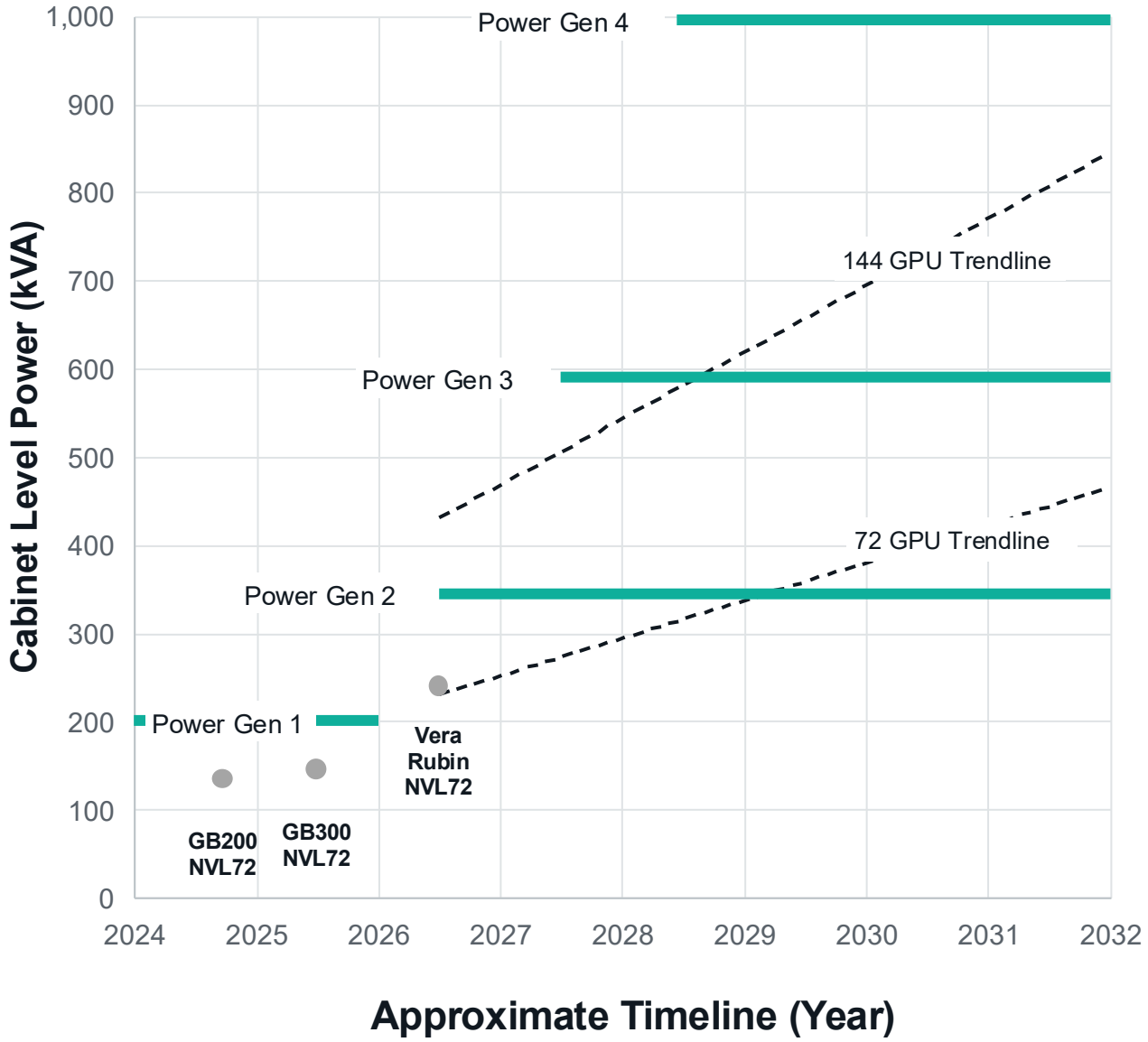
Liquid-Cooled Power shelf and 800 VDC Platform for Next-Generation Datacenters

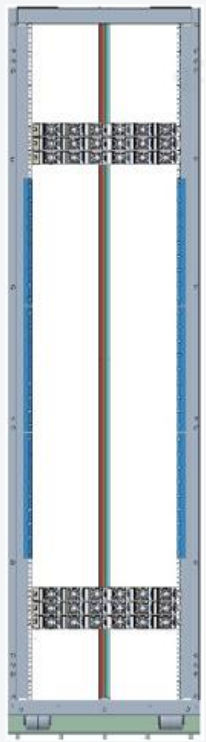
Jared Huntington, Senior Power Architect, NVIDIA
Roya Movahedi , Chief Marketing Officer, MEGMEET
Shi Lei, Lead Engineer, MEGMEET



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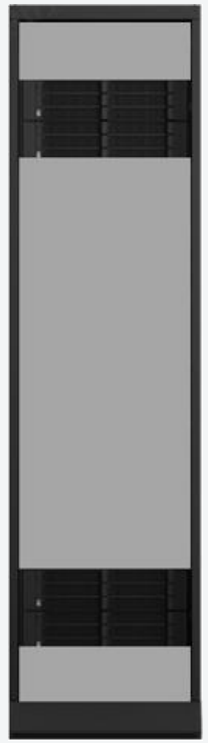
800 VDC Imperative





Gen 1

GB200/GB300
54 VDC
145 kW



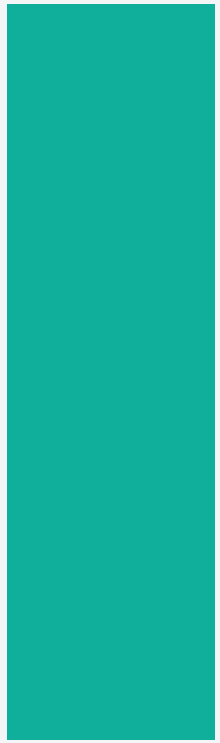
Gen 2

Vera Rubin NVL72
54 VDC
330 kW



Gen 3

54 VDC
570 kW
800 VDC into the PSUs
100% liquid cooled

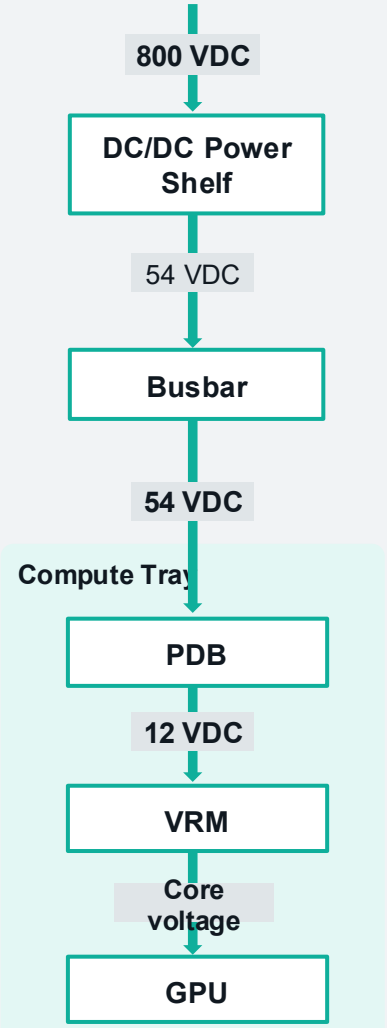


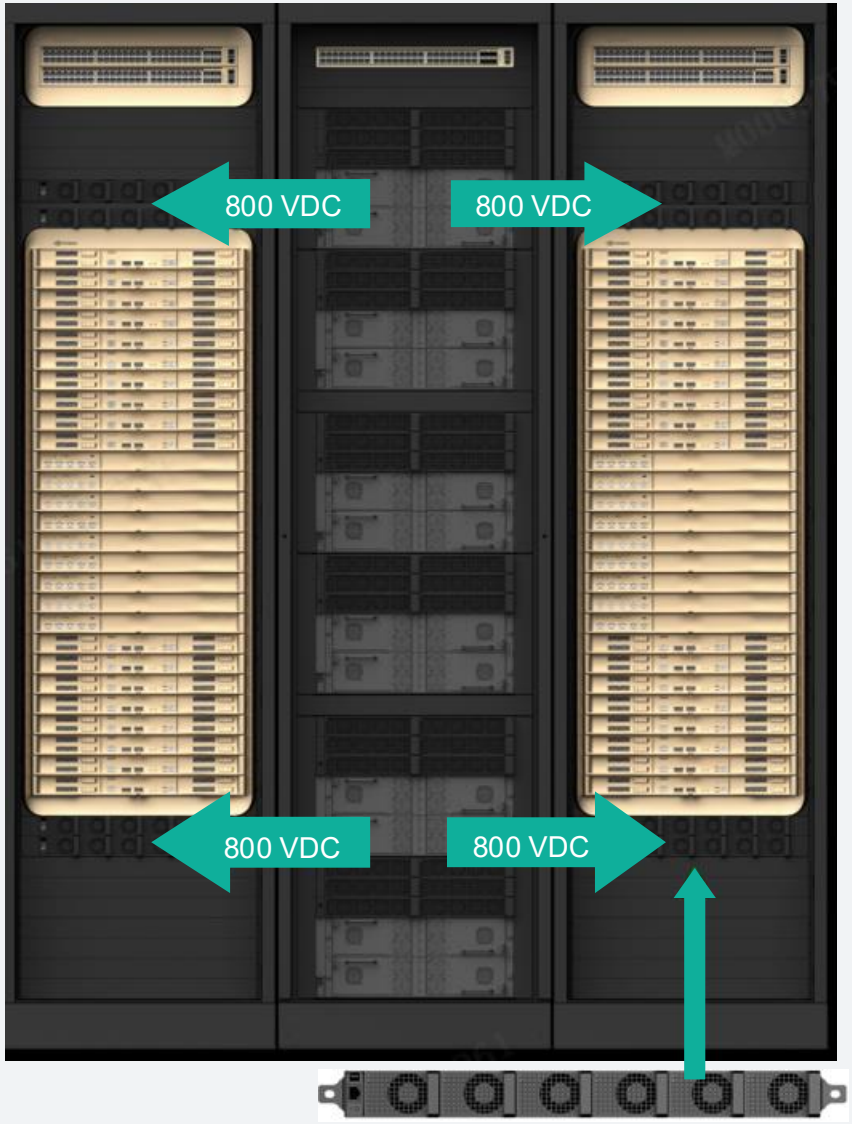
Gen 4

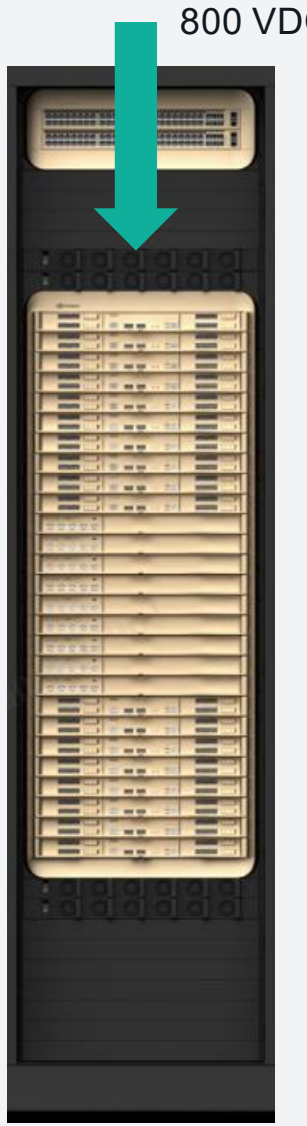
Power Rack Solution

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NVIDIA







Liquid Cooling – Rack

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NVIDIA

1. Air is not possible – 33-50 kW / rack limit

2. Fan power returns to compute – 10% return

3. Improved capacitor lifetime – lifetime doubles for every 10 °C

4. Eliminate points of ingress

5. Cable routing flexibility



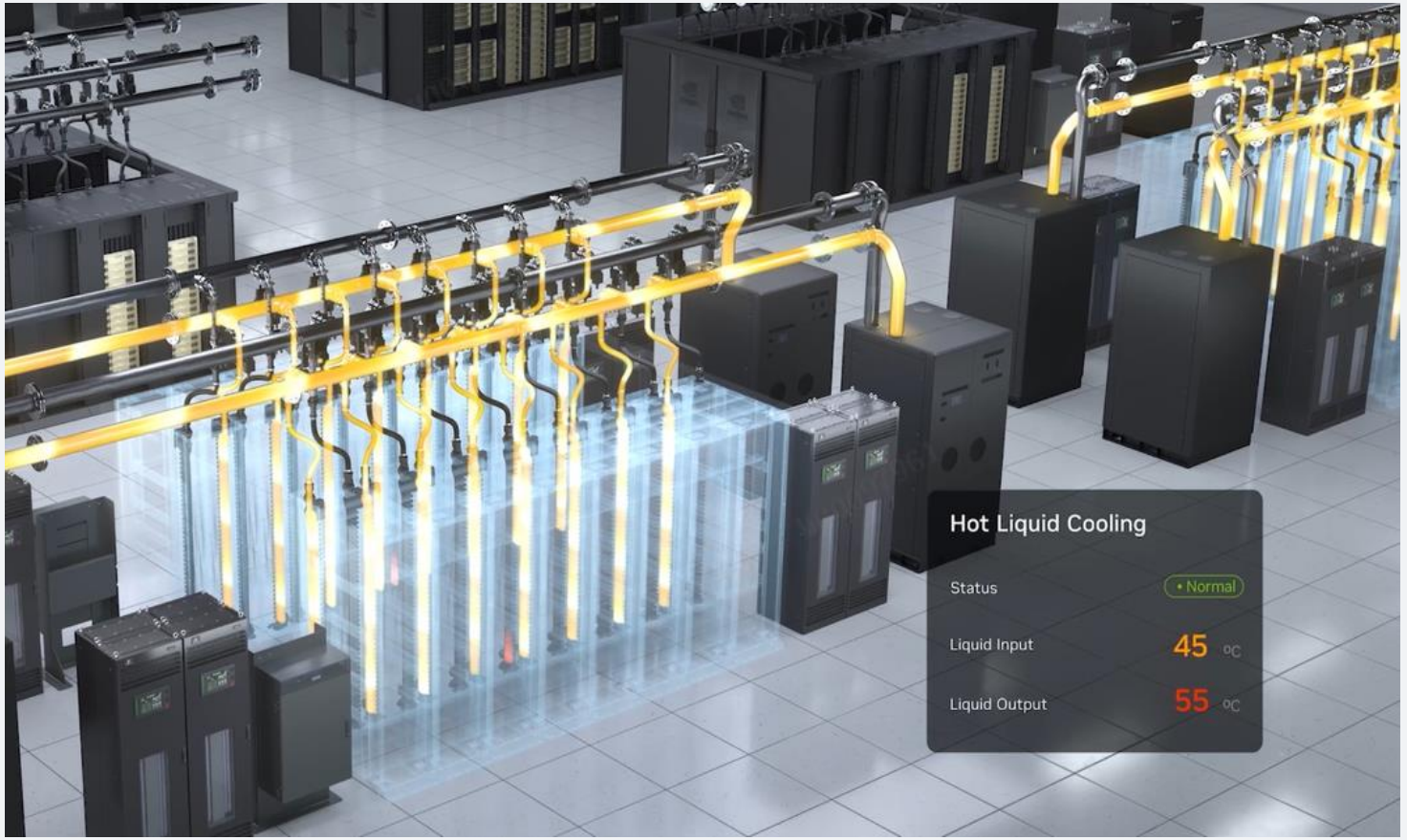
Power Rack 4:1 Compute to Power Rack Ratio

Liquid Cooling – Facility

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NVIDIA

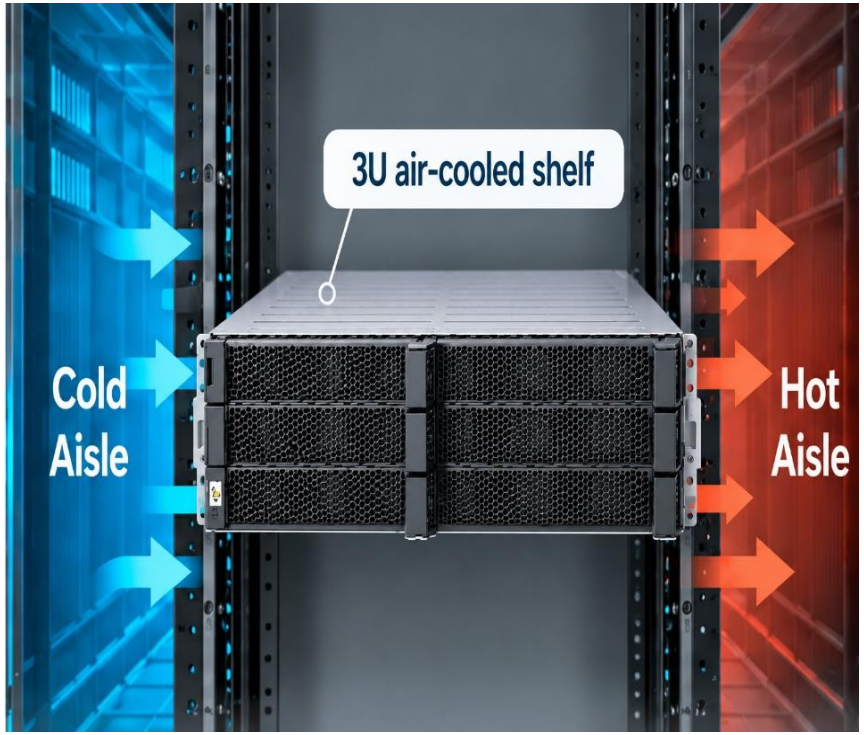
1. Eliminate chillers
2. Improved PUE
3. Density per megawatt increases
4. Heat reuse becomes viable
5. New layout possibilities without HAC



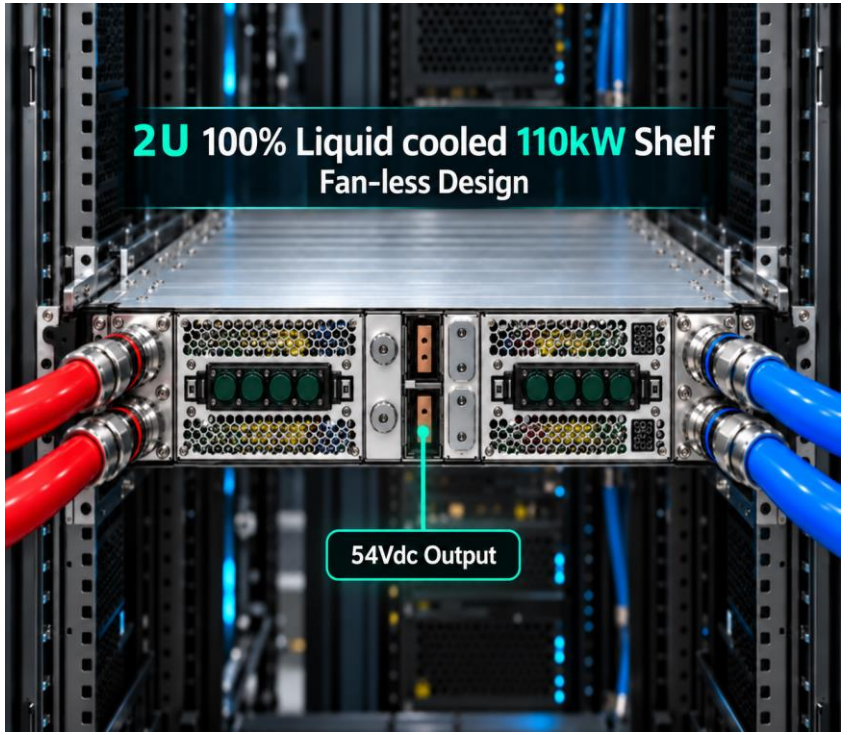
The Next Evolution in Cooling:
Liquid-Cooled Power Conversion

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Air-Cooled Power Shelf



Liquid-Cooled Power Shelf



Liquid Leak Safety protection



- Multiple leak sensors available for both PSU and shelf
- Cuts off input power if leakage is inside the shelf
- Redundancy provided in shelf; 55 kW still available if leakage is detected in one power supply

Components Longer life & Reliability



- E-CAPS in direct contact with cold plate
- SIC MOSFETs: Top-side cooling optimized for increased contact to cold plate
- Lower component temperature can improve capacitor life

Built on EV power experience

- High-volume EV power manufacturing experience
- Existing potting machines & manufacturing capabilities



Mechanical fan adds noise and potential failure points

Relies on conventional hot-aisle / cold-aisle

Lower power density

Dependent on room air-cooling

Reduced white-space footprint
No conventional room-air cooling infrastructure needed.

Higher power density ~18kW more per 1U

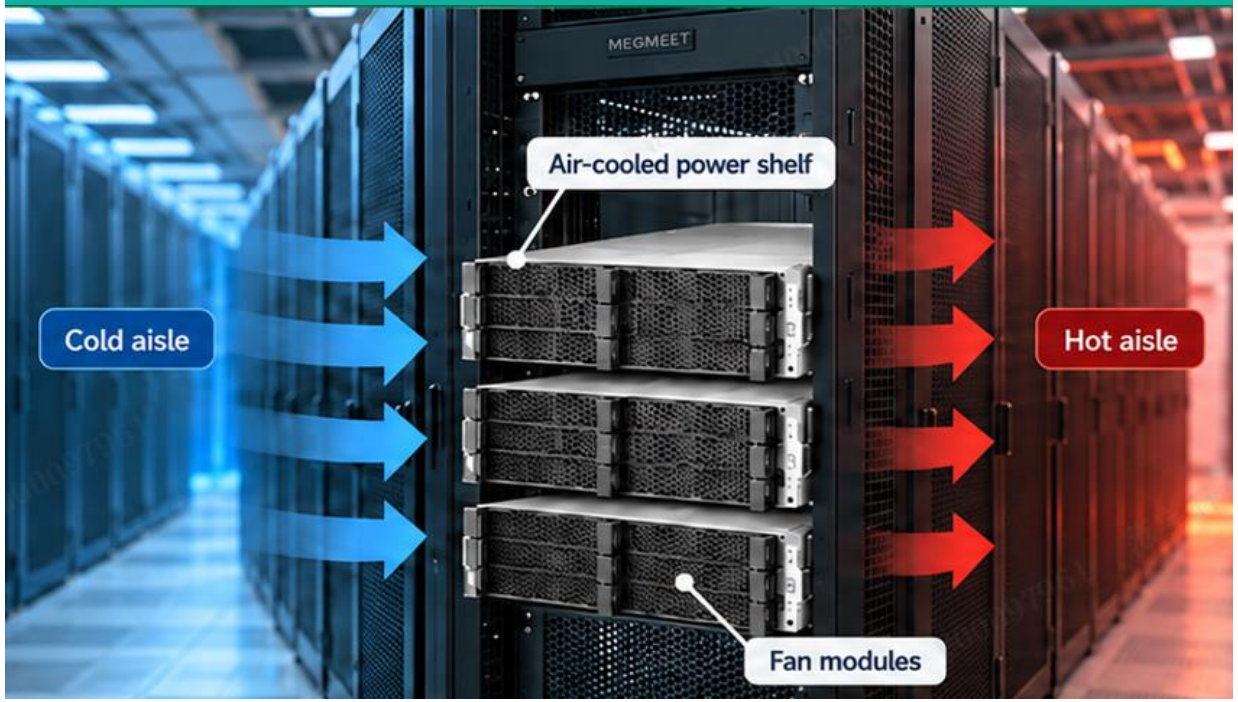
Better thermal performance with direct-contact cooling

Fully liquid cooled with no air used for power conversion

Fan Cooled vs. Liquid Cooled Infrastructure

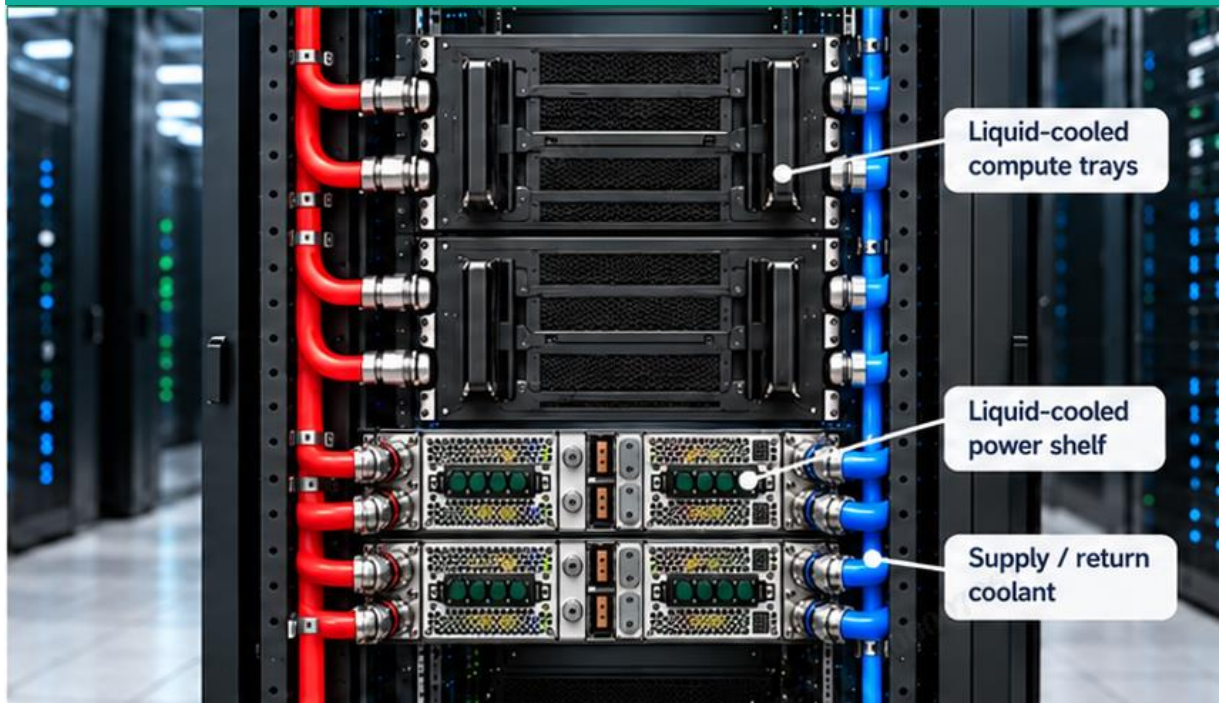
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Conventional Air-Cooled Power Shelf



Heat is transported through the room by air.

100% Liquid-Cooled Power Shelf + Compute



Heat is removed directly by liquid.
No thermal hot/cold aisle required for these racks.

Optimized greenfield 100% liquid-cooled design

Potential facility CAPEX:

Up to ~10%

Mainly from infrastructure reduction and space compaction, Labor saving.

Key takeaways

1. Liquid cooling can remove the thermal need for hot/cold aisles when both compute and power are liquid cooled.
2. Savings depend on facility design assumptions.
3. The benefit comes mainly from reduced air infrastructure and higher density.

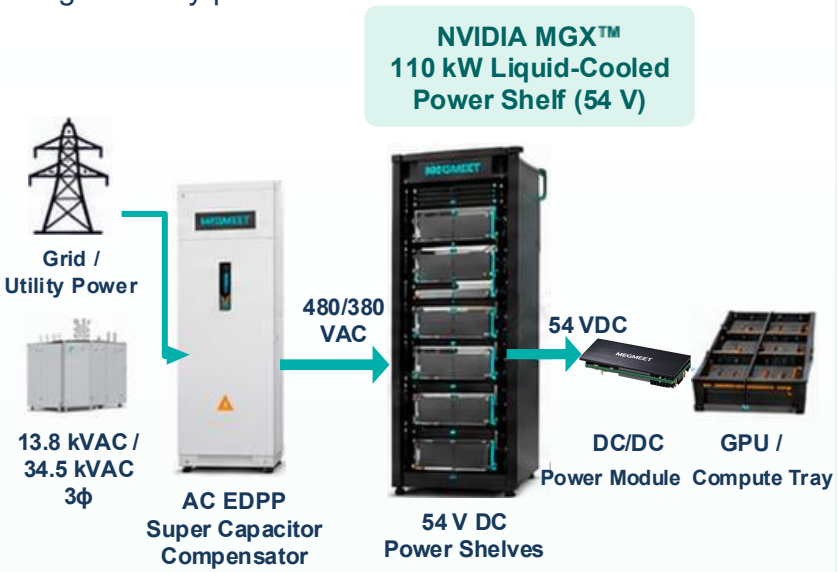
MEGMEET Power Architecture Evolution

From 54 V rack power to 800 VDC rack, row and facility infrastructure

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01 Today
54 V Rack Architecture

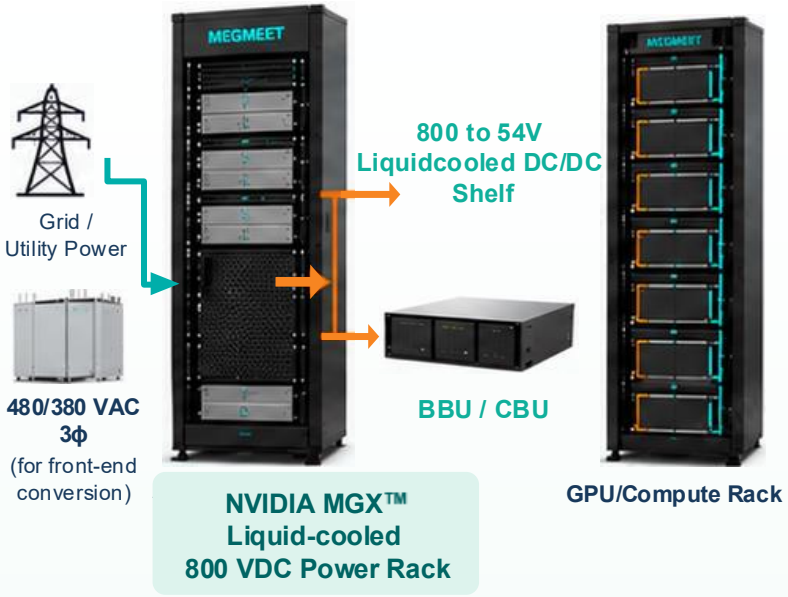
Proven 54 V architecture for today's AI racks, with fully liquid-cooled power shelves and High-density power modules.



- NVIDIA MGX™ 110 kW liquid-cooled power shelf (54 V)
- Mature, hot-swappable platform

02 Next-Generation
800 VDC Rack Architecture

Higher voltage distribution with 800 VDC bus and rack-level conversion closer to the compute load.



- NVIDIA MGX™ 100 kW liquid-cooled power shelf (800 V); 800 VDC distribution directly to the rack
- Conversion closer to the compute load (95 kW / 90 kW-class DC/DC shelves)

03 Fast Deploy Powerup "ready for 1st Token"

From rack to row to facility scale, enabling 800 VDC infrastructure for future AI factories.

Outdoor MEGMEET SST

Centralized solid state transformer with 800 VDC overhead busway.



- 800 VDC distribution directly to the rack via SST
- Conversion DC/DC Modules on compute board

Efficient and Fast Deploy Power Architecture

Today: 54V 2RU 110kW Liquid-Cooled AC/DC Power Shelf

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Liquid cool power shelf

Minimum liquid inlet temperature: +17 °C

Maximum liquid inlet temperature: +50 °C

Maximum liquid outlet temperature: +65 °C

Hot swappable PSU

Font View:



- **Dual AC input whip**
- **Bus clip for DC output**
- **Support NVIDIA MGX™ Rack**

Main Functions and Features

3Φ AC input	54 VDC output
2RU power shelf energy >10kJ	EDPP supported

Liquid-Cooled 800 VDC Power Rack

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AC Input

311~528 rms

Line-Line voltage (3L+PE)

Full load ≥ 342 VAC

Rack Power Density

800 kW standard

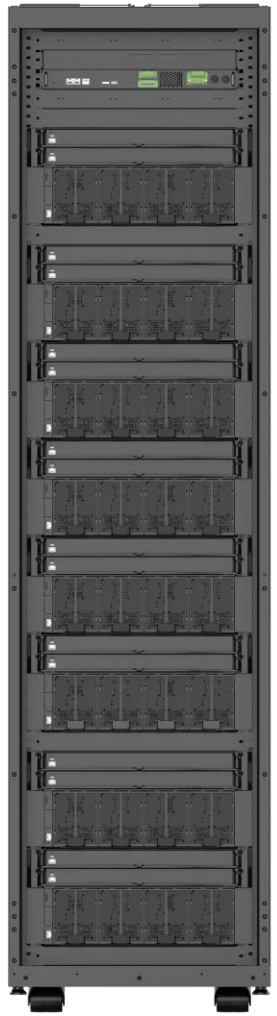
It can be expanded in the future

Power Shelf

100 kW

2*50 kW 1RU power modules

≥ 10 kJ EDPP Energy



Liquid-Cooled 800 VDC Power Rack

(W: 600mm D: 1200mm H: 2236mm)

BBU Shelf (optional)

89 kW discharge

Duration: ≥90s @ 40C

Lifespan: ≥5 years @ 40C

Auxiliary Power

300 W

Output voltage 50V±5V @Shelf

Rack Configuration

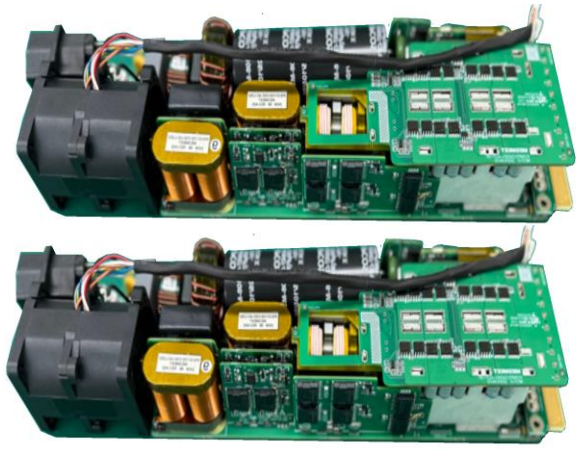
48 RU

Power shelf + capacitor shelf (optional)

Power Supply Air-to-Liquid Cooling: Power Density, Efficiency & Thermal Gains

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Cold plates directly contact heat sources, eliminating fans and heavy heat sinks — three dimensions improve simultaneously



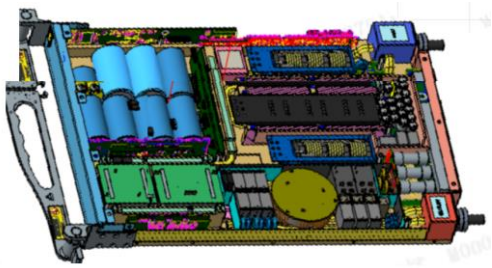
Fan + large aluminum heatsink

Switch to Liquid

- High power density
- High efficiency
- Good thermal performance
- High reliability

Liquid Cooling

2x power density



Coolant

Cold plate directly on heat source, no fan

01 Power Density

Eliminating fans and airflow channels, heat transfer shifts from air convection to forced liquid cooling. At the same power, PSU size can decrease to 50% .

02 Efficiency

Removing fan parasitic power (~2%–5%) and airflow resistance losses; lower junction temperatures reduce MOSFET switching and conduction losses, shifting the efficiency curve upward.

03 Thermal Performance

Liquid convection h is 1–2 orders of magnitude higher than air (25–250 → 1000–10000 W/(m²·K)); hotspot temperatures drop significantly, improving reliability.

Thermal path: Air「Junction→Case→Heatsink→Air」 vs Liquid「Junction→Case→Cold Plate→Coolant」 — shortened thermal resistance chain, order-of-magnitude cooling gain

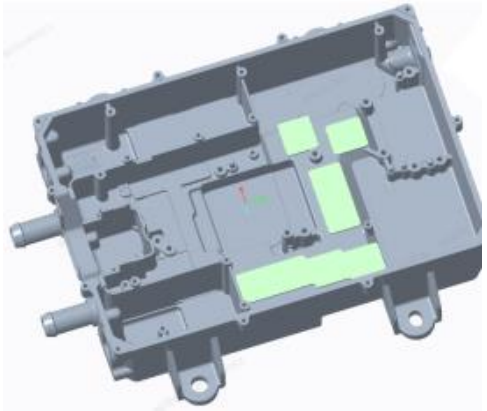
Cold Plate Technologies: EV vs. Datacenters

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Integrated aluminum housing vs. copper-tube embedded cold plate
— thermal performance, form factor and cost trade-off

EV Cold Plate

One-piece aluminum die casting with machined / Friction Stir Welding

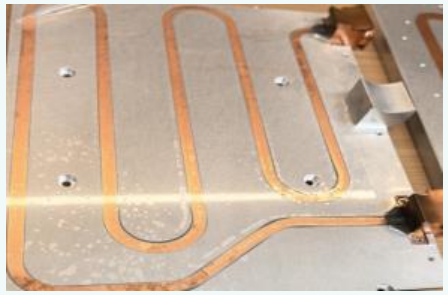


+ Strengths
- Low-cost, high-volume casting / FSW
- Rigid one-piece housing, vibration-proof
- High IP protection rating

– Limitations
- Aluminum k≈200 W/m·K limits heat flux
- Tall and bulky; limited uniformity
- Channel shape constrained by casting
- Low material utilization and heavy weight.

AI PSU Cold Plate

Aluminum base with copper tubes embedded



+ Strengths
- Copper k≈400 W/m·K — ~2× heat spreading
- Thin, low-profile stack height
- Flexible routing follows hot SiC devices
- Excellent thermal uniformity

– Limitations
- Higher BOM: copper + tube bending

Takeaway: The Datacenter power supply cold plate has high reliability and ~2× aluminum thermal conductivity, a thinner stack, and uniform cooling for high-heat-flux SiC / GaN devices — the preferred trade-off when power density outranks unit cost.

100KW 800V Liquid Cooled AC/DC Powershelf

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2RU without BBU



5RU with BBU



- **Dual AC input whip**
- **Support NVIDIA MGX™ Rack**

Liquid cool power shelf

Minimum liquid inlet temperature: +17 °C
Maximum liquid inlet temperature: +45 °C
Maximum liquid outlet temperature: +65 °C

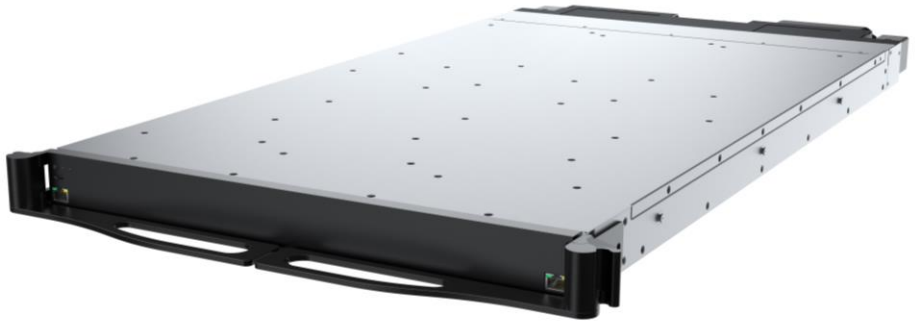
Hot swappable PSU

Main Functions and Features

- ✓ 3Φ AC input
- ✓ 800V/100kW output
- ✓ 2RU power shelf energy >10kJ
- ✓ EDPP supported
- ✓ 5RU power shelf with BBU support 90s hold-up time
- ✓ >98% efficiency

95kW 54V Liquid cooled DC/DC Power Shelf

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Font View:



- **Hot swappable DC input connector**
- **Bus clip for DC output**
- **Support NVIDIA MGX™ Rack**

Liquid cool power shelf

Minimum liquid inlet temperature: +17 °C

Maximum liquid inlet temperature: +45 °C

Maximum liquid outlet temperature: +65 °C

Hot swappable PSU

Main Functions and Features

800 VDC input

54 VDC output

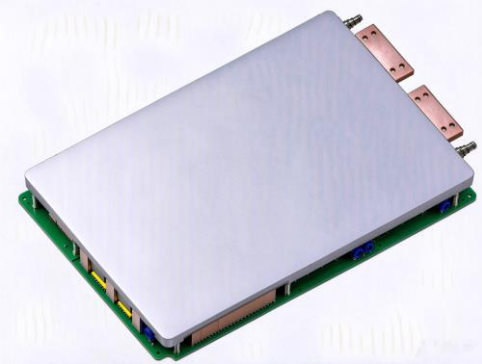
1RU power unit with PMC

EDPP supported

Liquid-Cooled 800-50 VDC DC/DC Module

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Power Distribution Board Solutions Liquid-Cooled



- Power: 30 kW
- Full load Efficiency up to 97.7% @ 800 Vin
- <40mm hight with coldplate
- Fixed ratio output voltage: 16:1
- Fully protected: Input UVLO and OVP, Output OVP, OCP and OTP
- Monotonic and Pre-biased startup
- No minimum load required
- Parallel Operation with Direct Output Connection and active current share
- 4242 VDC reinforced isolation: Input to Output / Heat spreader

DC/DC Power Module Liquid-Cooled



- Power: 10 kW
- 100% Liquid-cooled
- Peak efficiency up to 98.5% @800Vin
- Fixed ratio output voltage: 16:1
- Fully protected: Input UVLO and OVP. Output OVP, OCP and OTP
- Monotonic and Pre-biased startup
- No minimum load required
- Parallel Operation with Direct Output Connection and active current share
- 4242 VDC reinforced isolation: Input to Output / Heat spreader

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