



# Next-Generation Data Center: Sustainable, Simplified, Autonomous Driving, Reliable

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# Huawei: Leading provider of ICT infrastructure and smart devices

Bring digital to every person, home and organization for a  
fully connected, intelligent world



**196.000**

Employees



**107.000+**

R&D employees



**170+**

Countries and regions



**68+**

Interbrand's  
Top 100  
Best Global Brands

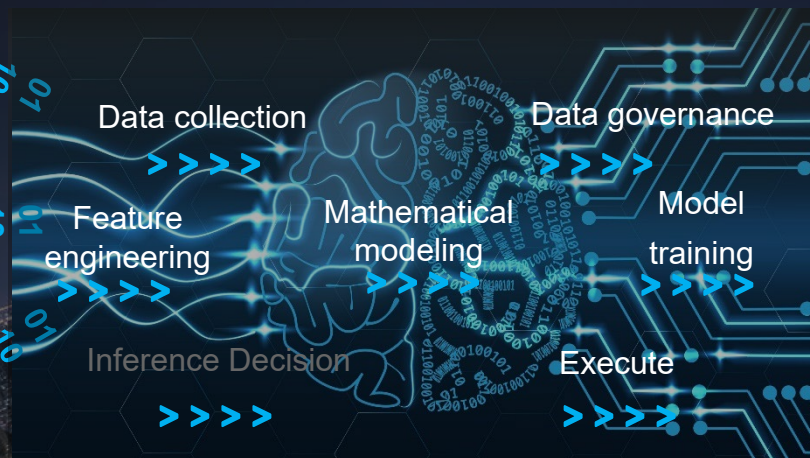
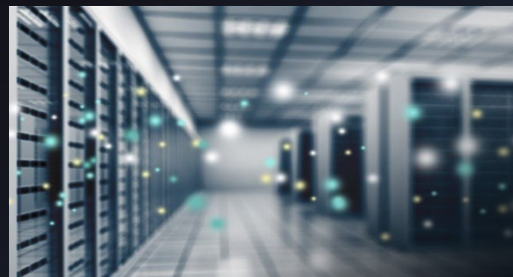


**44+**

Fortune Global 500



# Explosive Growth of Data and Computing Power in the Intelligent Era Drives the High-Density and Large-Scale Development of Data Centers



Intelligent  
diagnosis



**Early warning and  
early prevention**

Intelligent  
optimization



**Further improvement  
in energy efficiency**

Intelligent  
collaboration

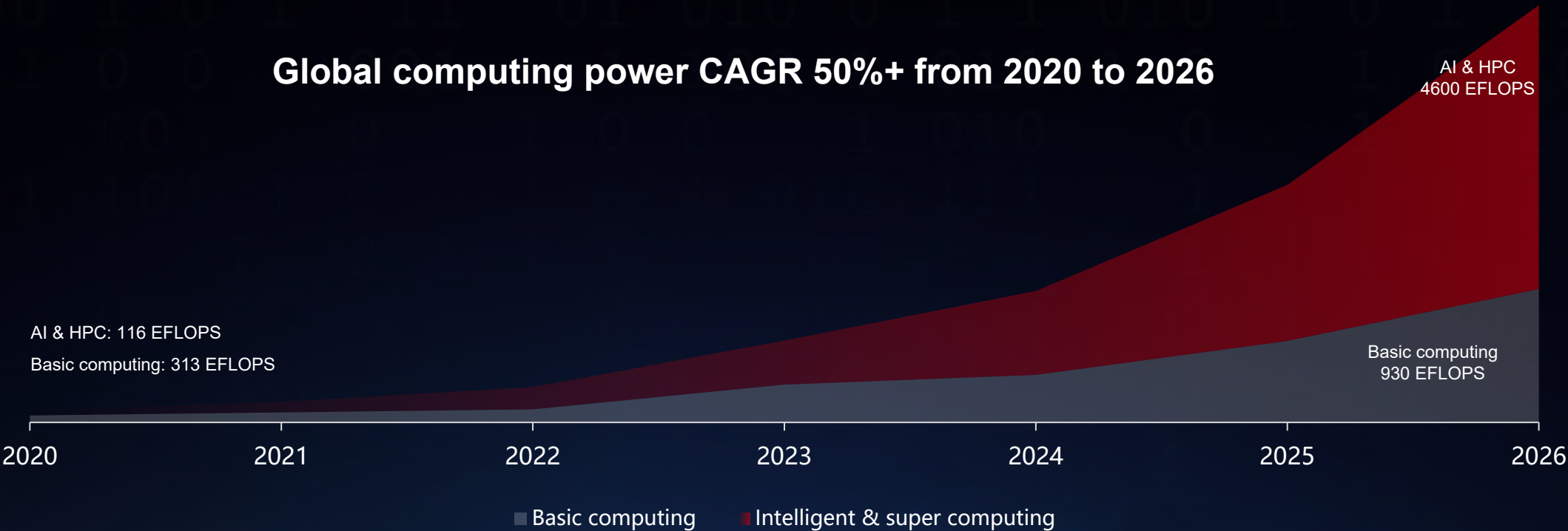


**Manual to automatic,  
reducing Opex**



# Explosive Growth of Data and Computing Power in the Intelligent Era Drives the High-Density and Large-Scale Development of Data Centers

Global computing power CAGR 50%+ from 2020 to 2026



Smart manufacturing  
AVIC (40P@2020)  
->100P@2025)



Weather forecast

Meteorological Administration  
(8.2P@2017->80P@2023)



AR/VR

Optimal experience, 24K, 1.3  
Gbit/s, 20 minutes < 190 GB



Autonomous driving

Level 4 autonomous cars  
100 TB/day per car



# Data Centers in the Low-Carbon Era Should Prioritize Efficient Use and Recycling of Various Resources

## Use

**70 million kWh** of electricity

**890,000 tons** of water

Rack utilization rate **50%**

**42,000 tons** of carbon  
emissions\*

## Recycling

**8,000 tons** of residual heat

Material recovery rate **15%**

Model: 12 MW data center, 1500 racks x 8 kW, 2N architecture, load rate 50%, PUE 1.3

\* Carbon emissions in scope 2, excluding scopes 1 and 3



# What Kind of Data Centers Will be Needed by 2030?

Interaction of energy

## **Sustainable**

**All** Green

**All** Efficient

**All** Recyclable

Composition of matter

## **Simplified**

**Simplified** Architecture

**Simplified** Power supply

**Simplified** Cooling

## **Reliable**

Proactive Security    Secure Architecture

Usage of information

## **Autonomous driving**

O&M **Automation**

**Automatic** Energy Efficiency Optimization

Operation **Autonomy**



## Trend 1

### Zero carbon DC

Carbon neutrality triggers a green revolution, Data Center PUE Enters the 1.0x Era and "Zero Carbon" DCs Will Realize



#### Green Power

- Green power, such as **wind energy** and **solar energy**, will be more widely used in data centers.



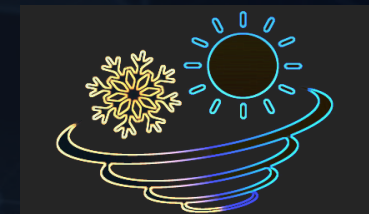
#### Power saving water saving

- The **PUE** requirement is more strict, 1.4 -> 1.3 -> 1.2.
- With the continuous evolution of cooling technologies, **CLF** enters the 0.1 era.
- **WUE** Becomes a Green Data Center Evaluation Indicator



#### Thermal Energy Recovery

- In large-scale data center campuses, **heat recycling**, as a **new energy-saving solution**, has started to be implemented in large-scale data center campuses.



# Sustainable – All Efficient: PUE → xUE, One Dimension → Multi-Dimensional System

## Evaluation indicator: PUE → xUE

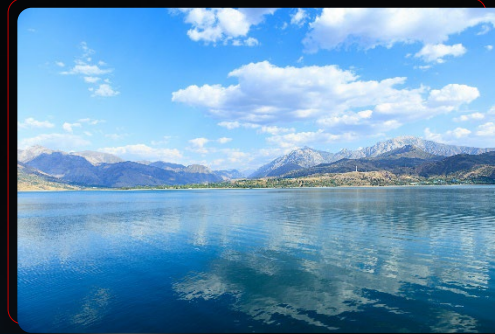
CUE



PUE



WUE



GUE



$$\mathbf{xUE: \alpha CUE \mid \beta PUE \mid \gamma WUE \mid \delta GUE \mid \dots}$$

*CUE : Carbon Usage Effectiveness*

*PUE: Power Usage Effectiveness*

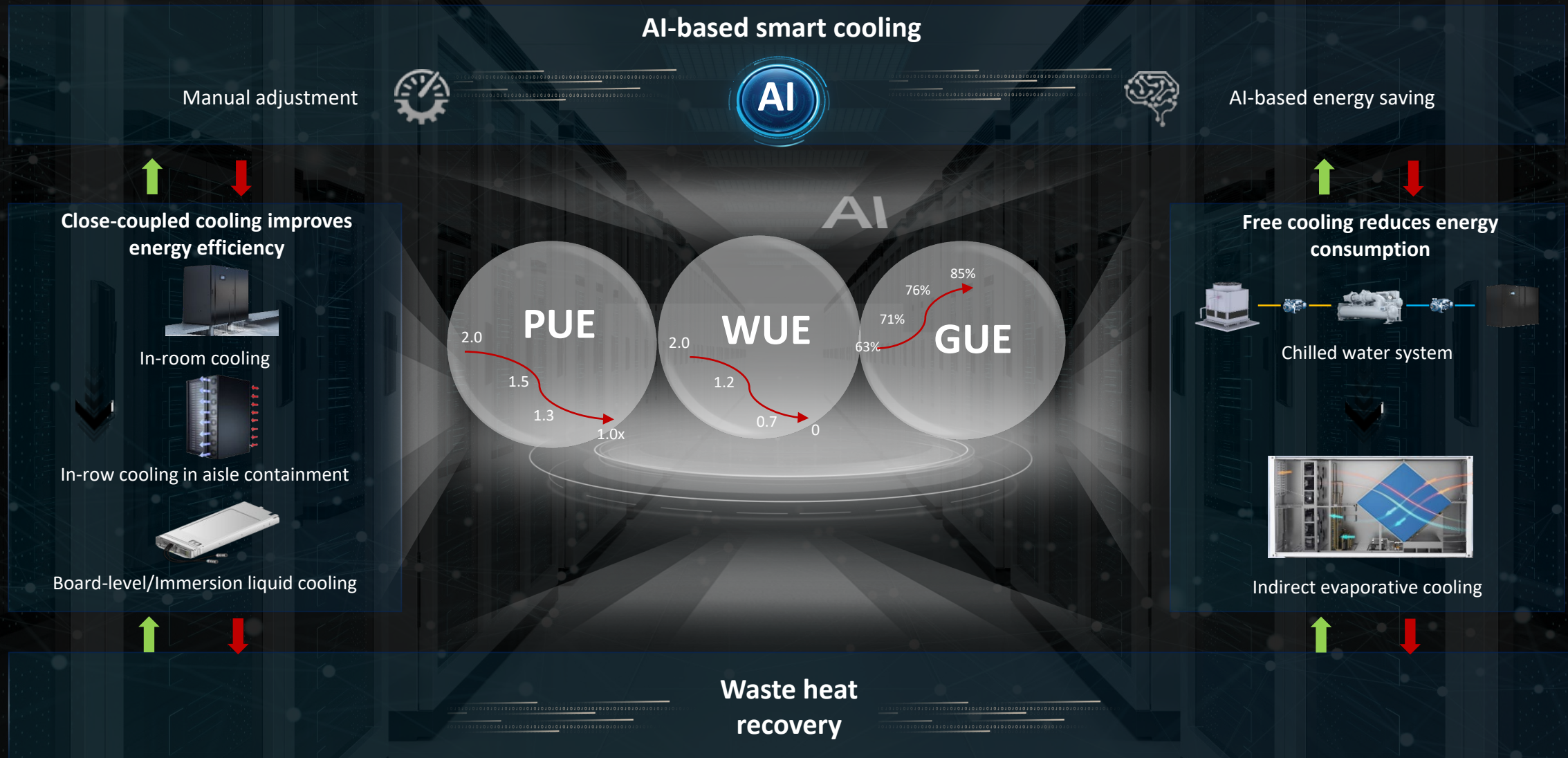
*WUE: Water Usage Effectiveness*

*GUE: Grid Usage Effectiveness*

*$\alpha / \beta / \gamma / \delta$  are used to balance the importance of each indicator. The values vary with regions/industries.*

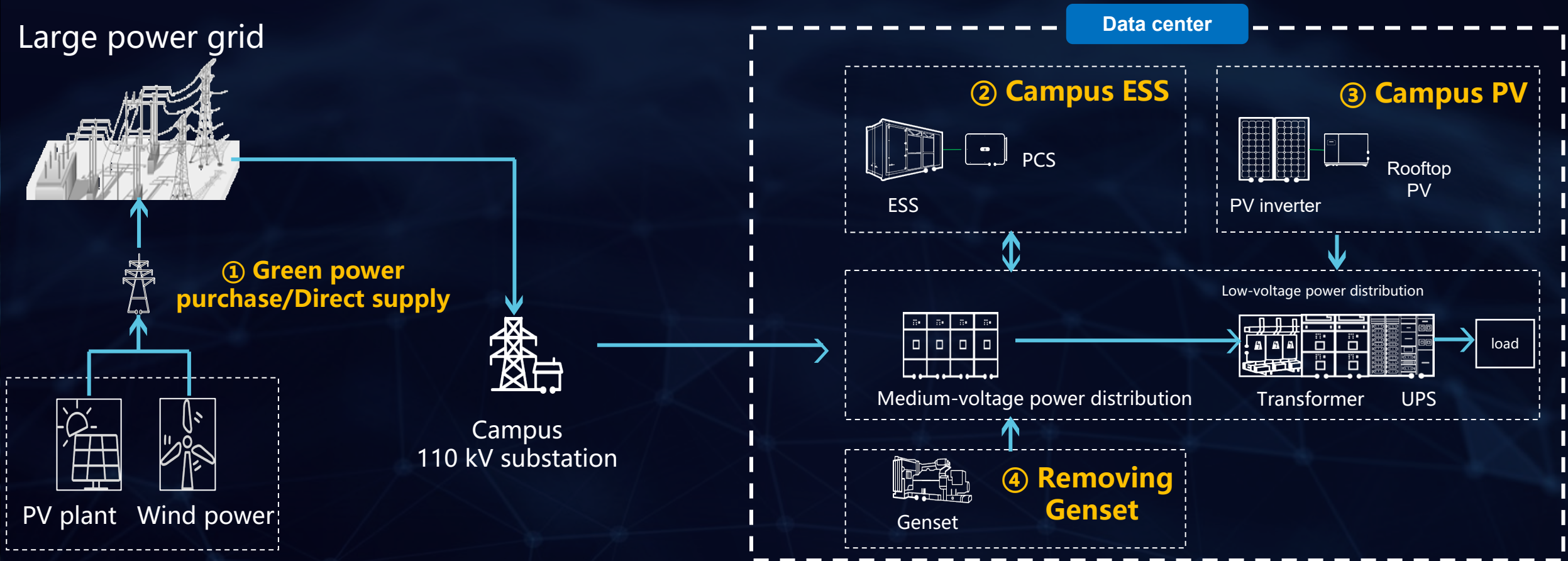


# Cooling & Heat Recovery for an Optimal xUE





# Clean Power Supply: Increasing the Percentage of Clean Energy in DC



## ① Green power purchase/Direct supply

People made great efforts to develop clean sources such as photovoltaic and wind energy

## ② Campus ESS

Flatten the peak and valley electricity prices of the grid.

## ③ Campus PV

Making full use of resources such as the roof of the data center campus

## ④ Removing Genset

Hydrogen application instead of gensets



# **100% Clean Energy Data Center in MEA**

## **Full Prefabricated Modular Data Center For Moro MBR Solar Park**

**5.5 days**

installed **49** DC modules

**6 months**

rollout **1.8MW**, **2,000m<sup>2</sup>** DC

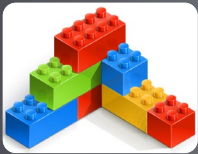
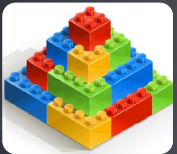
**100%**

clean energy driving

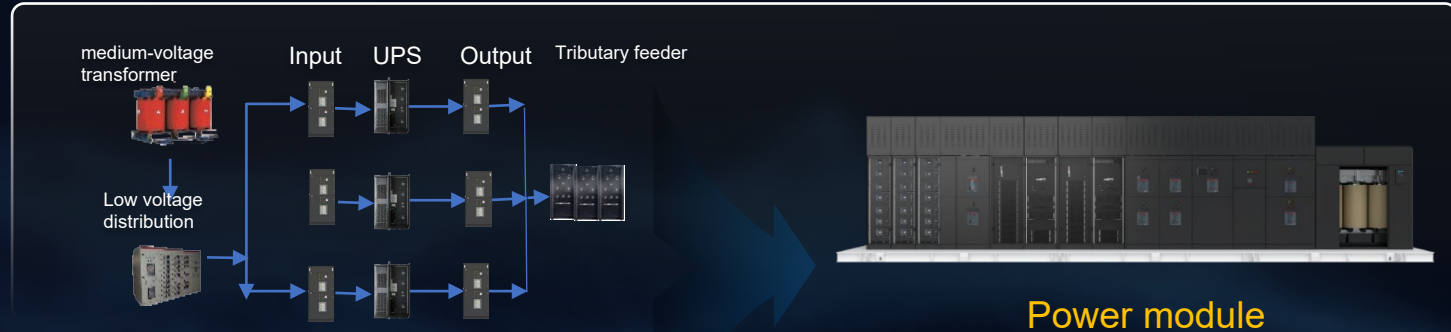
## Trend 2

## Simple Architecture

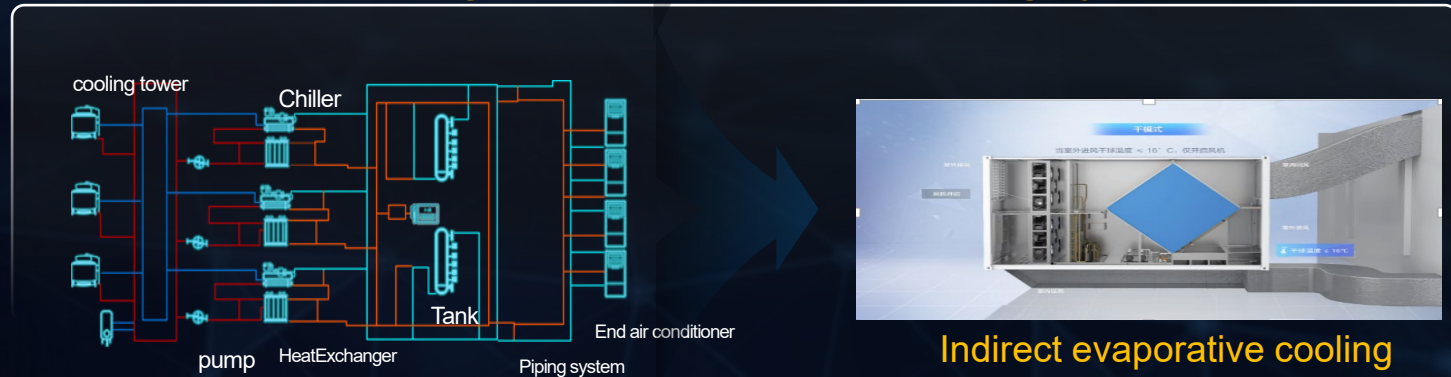
Converged, prefabricated, system-level, and DC-level simplified architectures will become mainstream applications.



## Convergence and simplified Power Supply System



## Convergence and simplified cooling system



## Simplified DC prefabrication

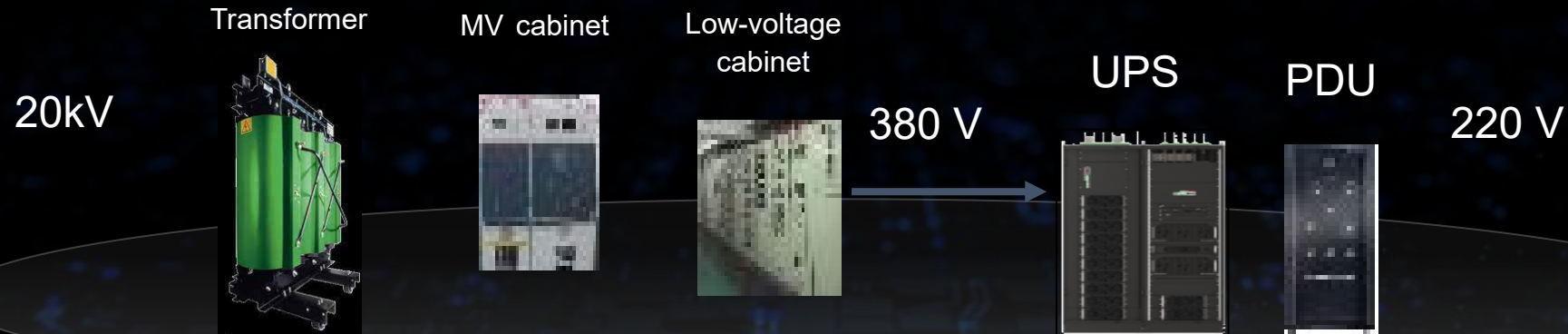


Prefabricated data center

- Prefabrication delivery: TTM from 20 months to 9 months for 1000 cabinets
- Full modular design: on-demand deployment, phased investment, and low initial investment
- Elastic architecture: supporting IT evolution



# Simplified – Simplified Power Supply: Redefined Components and Links



## Component integration

Footprint saving

40% smaller footprint

Time saving

2 months → 2 weeks delivery

Transformer Cable inlet and bus tie cabinet SVG UPS Maintenance bypass Feeder cabinet



Power saving

60% lower power loss

Worry free

38% lower fault rate in SLA

Physical connections → Converged power supply

# Simplified – Simplified Cooling: Interaction Between Cooling and Heat

## Indirect Evaporative Cooling



**Simplified  
cooling link**

Maximized use of free cooling sources and one heat exchange

## Working Mode

Ambient T°C	Mode	Fans	Pumps	DX
Dry bulb ≤ 16°C	Dry Mode	ON	OFF	OFF
Dry bulb > 16°C and wet bulb ≤ 19°C	Spray Mode	ON	ON	OFF
Wet bulb > 19°C	Hybrid Mode	ON	ON	ON



# Simplified – Simplified Architecture: Innovative Buildings and Equipment Rooms

## Prefabricated buildings



Breaking a whole into parts: parallel works thanks to product design of engineering

## Modular equipment room



Integrating parts as a whole: all in one instead of combination



# Low-carbon Construction: Innovative Construction, Prefabrication + Modularization, High Recovery



- **80%** recovery rate, reducing carbon emissions by **8,000+t**
- Fewer "three wastes", **62 tons** of construction waste, **80% reduction**
- The data center TTM is **shortened by 50%** (from June to September 2018).
- One DC at one layer, **continuous evolution** of modular design
- Low air leakage rate (10% to **3% to 5%**) and low cooling loss

*\* 1500 cabinets, 8 kW/cabinet, 2N, 40-year lifecycle*



# Next Generation Indoor Solutions

**FusionModule500**



**FusionModule800**



**FusionModule2000**





***“Insanity is doing the same thing over and over again and expecting a different result.”***

**Traditional Approach**



**VS**

**Next Generation FusionModule800**





## Trend 3

# Fully digitalized

Digital technologies are more and more widely used in data centers, All-DC visualization, manageable, and controllable



**Digitalization of data centers throughout the lifecycle from planning → construction → maintenance → optimization**



- Digital survey
- Tool-based design

- BIM application and digital construction

- BIM+DCIM, digital O&M

- BIM+ simulation, digital optimization

**Digitalization of devices and terminals and instant messaging technologies support digital foundations.**

### Digital equipment



Intelligent Power supply



Intelligent Cooling



Intelligent Module

### Sensor and intelligent terminal



Sensor



machine vision



Robot

### communication technology

5G

5G

PLC

PLC



IOT



# Autonomous Driving – Automatic Energy Efficiency Optimization: Enables Smart Cooling



# Autonomous Driving –Keeps Personnel Away from Equipment Rooms, Maximizes Resource Value

Manual inspection ↓  
AI-based remote inspection



Digital and  
Standardized O&M



Resource Optimization  
@AI



Energy Scheduling  
@AI



2020 German Red Dot Design Award: Service Innovation, Easy-to-Use Interface, and Best Experience





**We Do Not Inherit The Earth From Our Ancestors,  
We Borrow It From Our Children.**