Smart DC, Building the Green Future

Huawei Next-Generation Smart Data Center Solution

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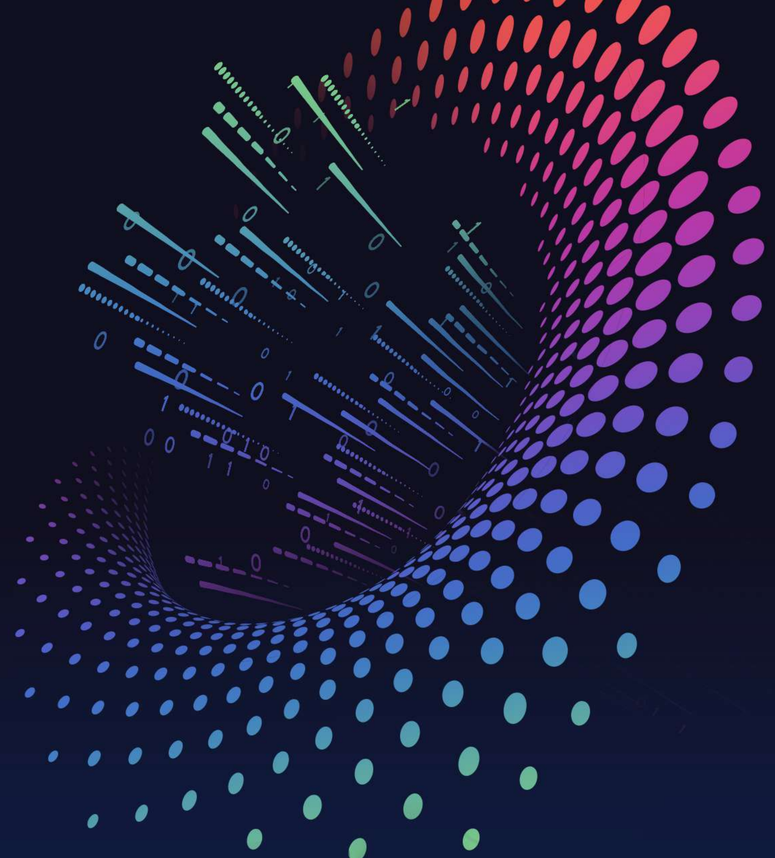


Trend of DC in CEE&Nordic Europe

High energy prices

High xUE

Carrier Colo Transformation

Next-Generation Data Centers: Driven by Innovation, Building a Low-Carbon Intelligent Computing Base

Major Challenges to Traditional Data Center Construction

High energy consumption | Long construction period | Difficult O&M | High security risks

Sustainable

Simplified

Autonomous Driving

Reliable

Sustainable: Efficient Use of Resources Throughout the Life Cycle

All Green

Electricity

Use green power on a large scale
Use renewables such as PV, wind power, and hydropower instead of thermal power.

Water

Use less clean water
Use reclaimed water or even no water.

Land

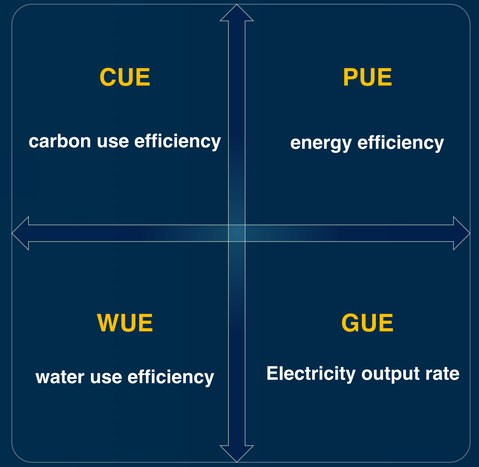
Use land in an intensive way
Enable each square meter of land to carry more computing power.

Climate

Use more free cooling
The free cooling duration can be extended if temperature and humidity are proper.

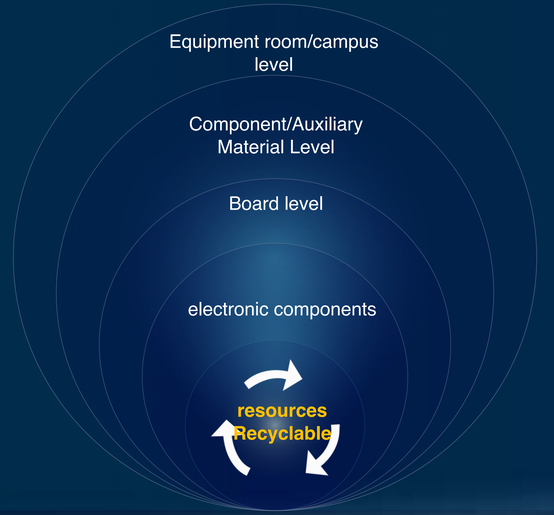
All Efficient

Evaluation indicator: PUE → xUE



All Recyclable

Recycle materials at component, room, and campus levels.



Simplified: Reshape Product Forms of Architecture, Power Supply, and Cooling

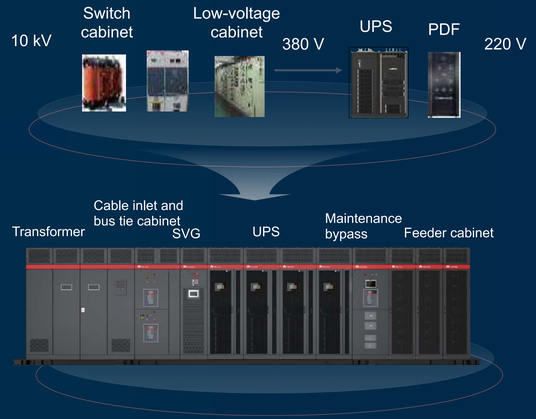
Simplified Architecture

Prefabricated buildings

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

Simplified Power Supply

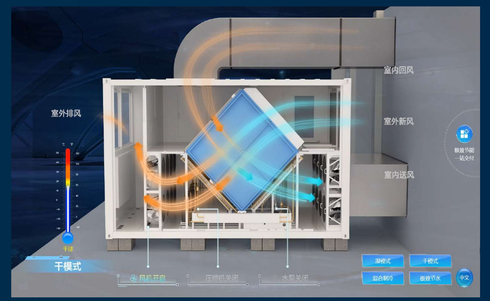
Component integration



Physical connections → Converged power supply

Simplified Cooling

Simplified cooling link



Maximized use of free cooling sources and one heat exchange

Autonomous Driving: AI Maximize the Value of "Maintenance, Optimization, and Operation"

O&M Automation

Manual inspection → AI-based remote inspection

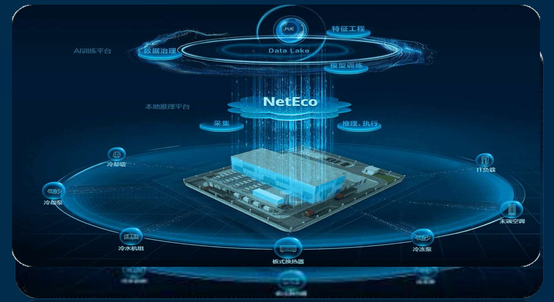
Smart sensing @IoT/voice recognition/ image recognition

Inspecting 2000 racks，2 hours → 5 minutes

Automatic Energy Efficiency Optimization

Enables Smart Cooling

Auto energy efficiency optimization @AI



Water-cooled chilled water：**8%-15%,**

Air-cooled chilled water：**5%-10%**

Operation Autonomy

Maximizes Resource Value

Intelligent matching between SPCN demand and supply

Resource utilization： 65% → **85%**

Reliable: Build a Comprehensive Defense Line for Data Center Infrastructure.

Secure Architecture

Enhanced resilience and defense

Modular design, lossless switchover, and always-on

Component level
Hot swap
5 min recovery

Device level
Redundancy design
0 ms transfer

System level
E2E control
99.999% availability

Power electronics + ICT technologies

Proactive Security

AI predictive maintenance

Fault prediction

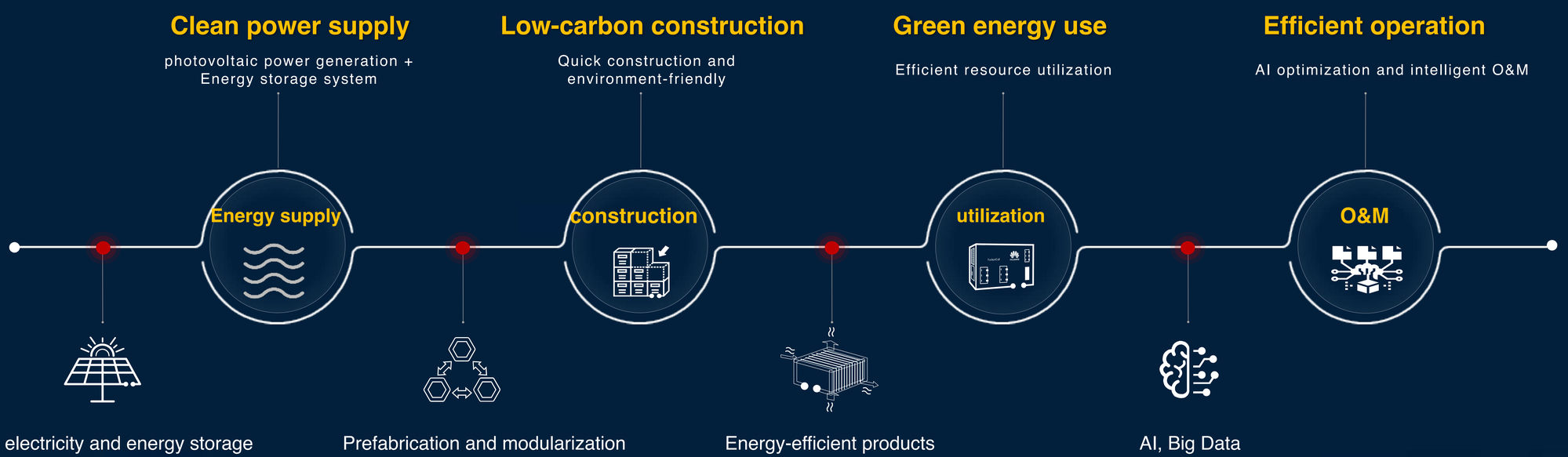
Remedy → Prevention

Automatic fault response

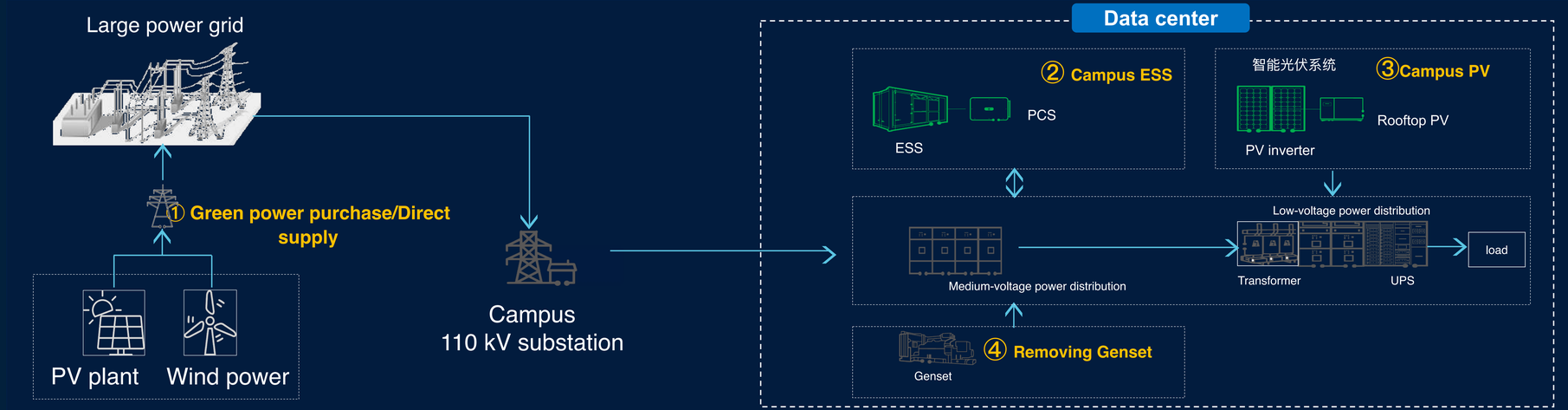
1 min discovery, 3 min analysis, 5 min service recovery

Manual response → Automatic response

Build a Low-carbon Smart Data Center Based on The Four Concepts of The Next-Generation Data Center



Clean Power Supply: Increasing the Percentage of Clean Energy Using in DC Clusters



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.

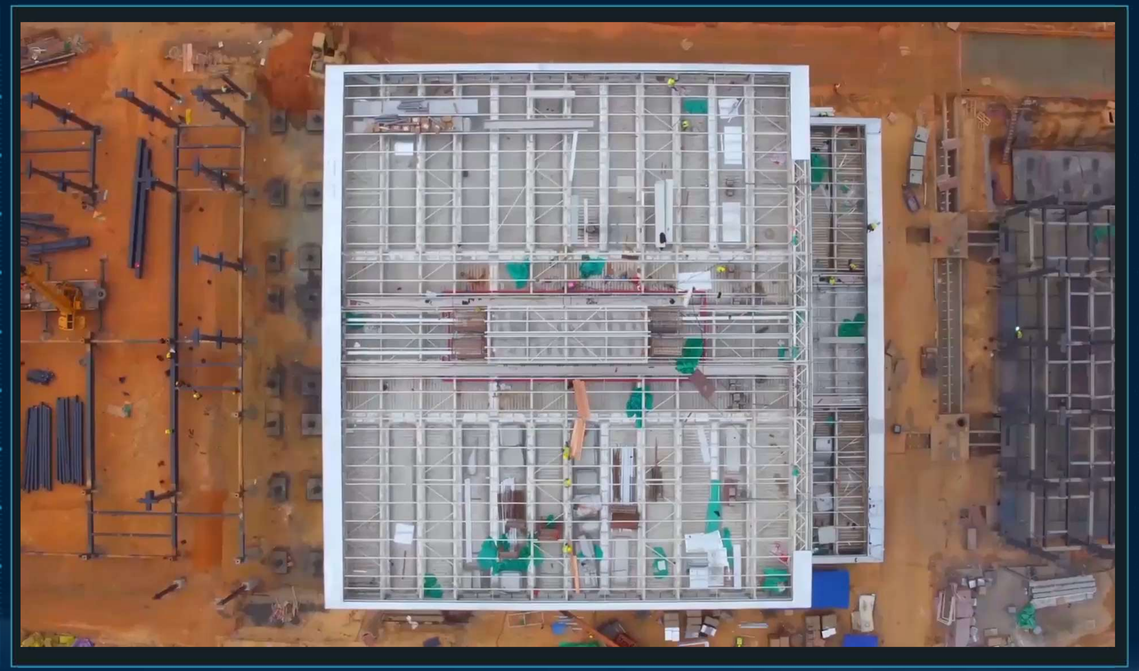
③Campus PV

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

④ Removing Genset

Hydrogen application instead of gensets

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

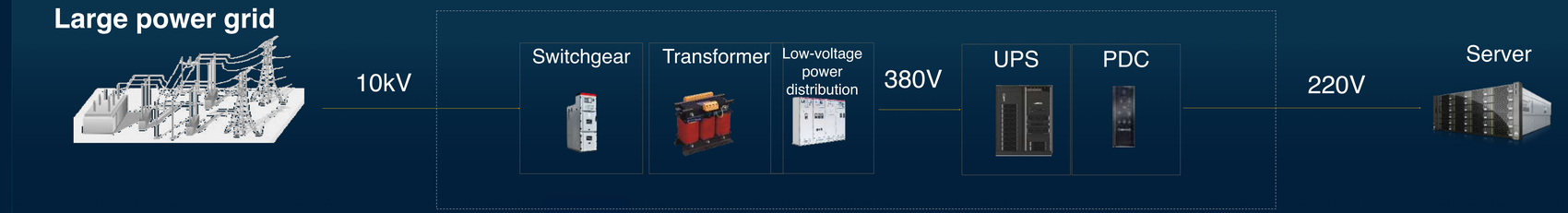


- **80%** recovery rate, reducing carbon emissions by **8,000+t**
- Fewer "three wastes", **62 tons** of construction waste, **80% reduction**
- The data center TTM is **shortened by 50%** (from June to September 2018).
- One DC at one layer, **continuous evolution** of modular design
- Low air leakage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

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

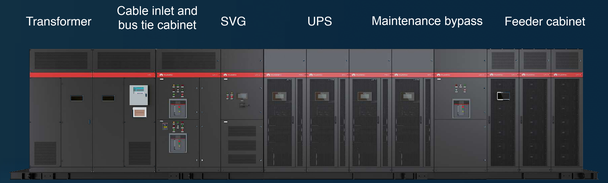
Green Energy Use: Efficient Power Supply, Shorten Transmission Paths, Improve Conversion Efficiency

Traditional DC Power Supply: Long Transmission Paths, Multiple Conversion Layers, and Low Efficiency



Power supply link efficiency： 94.5%

Full busbars power supply architecture. Reshape power modules and switches



- Power saving: **Power supply link efficiency is 97.8%** (intelligent online mode). A 2.5 MW system saves **470,000 kWh/year.**
- Reduced area: Component integration, 2.5 MW@11 cabinets,, and **reduced footprint by 40%**
- Time-saving: Products prefabricated, cables converted into busbars, **delivery period reduced from 2 months to 2 weeks**.
- Peace of mind: **Automated self-prevention** and iPower support to build an "autonomous driving" power supply system

Core technology: Reconstruct power modules and load switches, **600 kVA/cabinet**. Hot backup unit, hardware clamping patent, intelligent-online mode realize **0 ms switching**

Green Energy Use: Efficient Cooling, Use Natural Cooling Sources, Reduce Energy and Water Consumption

Indirect evaporative cooling: Reshape cooling system to maximize the use of natural cooling sources @AI

Chilled water system

7 sub cooling systems Tower Chiller Pump Tank CRAH Pipe Valve

6 auxiliary systems UPS Battery Damper BA Humidifier

- Long construction period, the cooling system takes up 66 % time.
- Four-time heat exchange, low exchange efficiency
- Seven components, which depend on manual O&M

EHU

Cooling

Dust filtration

Humidity control

AI optimization

Two-in-one damper

Continuous cooling

- **One box, one system**, simplified delivery
- From chilled water to natural cooling sources， One time heat exchange
- **AI-supported**, the only commercial AI energy saving
- Lithium battery direct drive, continuous cooling, **"0" interruption**

	Traditional Solution	EHU	
	7 cooling system + 6 auxiliary systems	1 cooling system+1 energy storage system	Heat transfer stages 4→1
TTM	6 months	3 months	50% less
PUE	1.22	1.15	Saving power 32% Annual saving 0.44M $
WUE (L/kWh)	1.41	0.94	Saving water 33% Annual saving 22k $
O&M	12 O&M personnel	9 O&M personnel	O&M personnel reduced by 25% Annual saving 45k $

Model: 1500 racks, 8kW/R, 50% load@Beijing, 0.12$/kWh

Efficient Operation: Improve O&M Efficiency and Reliability, Optimized Resources Using

Manual inspection → AI-based remote inspection

Smart sensing @IoT/voice recognition/ image recognition

Reduce people on site, unattended

Change from passive to active prediction

AI high temperature warning
AI lifespan prediction
AI fault alarm

Reduce resources invoked to handle failures

Resource optimization@AI

Intelligent matching between SPCN demand and supply

Optimized utilization of resources and balanced air distribution

Energy scheduling@AI

On-demand call of green power, energy storage, and backup power

Using Energy Storage to Achieve Peak Cutting and Valley Filling

SPCN：Space，Power，Cooling，Network

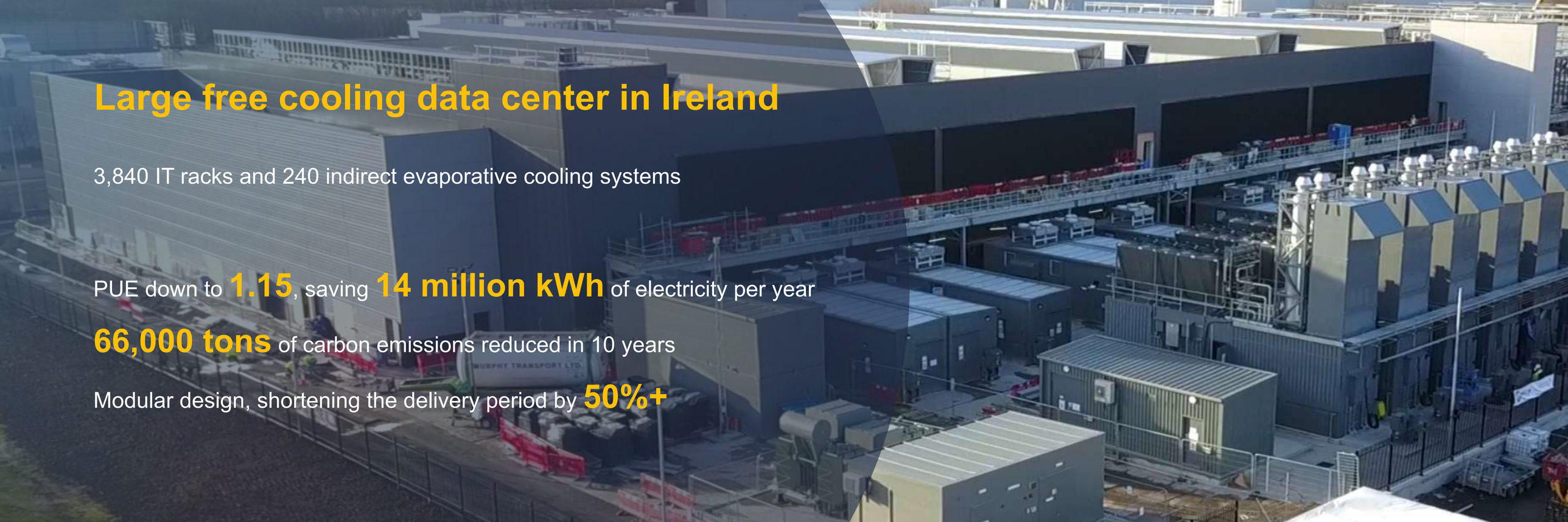
100% solar energy DC in Mideast

Total scale of 18 MW, containing 490 pre-fab. modules

5.5 days to deploy **49** pre-fab. Modules

8 months to deliver a **1.8 MW** data center with a footprint of 2,000 m^2

100% powered by clean energy, preventing annual carbon emissions of **13,000 tons**



Large free cooling data center in Ireland

3,840 IT racks and 240 indirect evaporative cooling systems

PUE down to **1.15**, saving **14 million kWh** of electricity per year

66,000 tons of carbon emissions reduced in 10 years

Modular design, shortening the delivery period by **50%+**

Thank You!