

Huawei Smart & Green Data Center



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HUAWEI

Huawei: Leading provider of ICT infrastructure and smart devices

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

Huawei's end-to-end portfolio of products, solutions and services are both competitive and secure. Through open collaboration with ecosystem partners, we create lasting value for our customers, working to empower people, enrich home life, and inspire innovation in organizations of all shapes and sizes.

At Huawei, innovation focuses on customer needs. We invest heavily in basic research, concentrating on technological breakthroughs that drive the world forward.



194.000

Employees



104.000+

R&D employees



170+

Countries and regions



68+

Interbrand's
Top 100
Best Global Brands



44+

Fortune Global 500

Huawei: UN Global Compact



United Nations
Global Compact

Participant since 9. November 2004



Huawei: Tech4All, Environments and Development

Examples for Projects and Programs



Forests



Oceans



Wetlands



Digital village



Huawei: Examples for innovation and sustainability

New Smart-Car innovation center



Sustainability Report 2020



Huawei: Leading provider of ICT infrastructure and smart devices



Platform + Ecosystem, Facilitates Industry Success



Software Platform
Open resources to develop applications



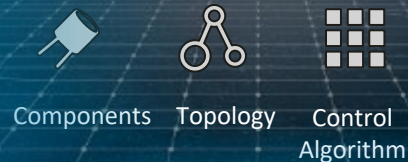
Hardware Platform
Huawei Inside, being integrated



Ecosystem Partner
Work together for mutual benefits and win-win

Three Core Technologies

Power Electronics



Communication



Cloud

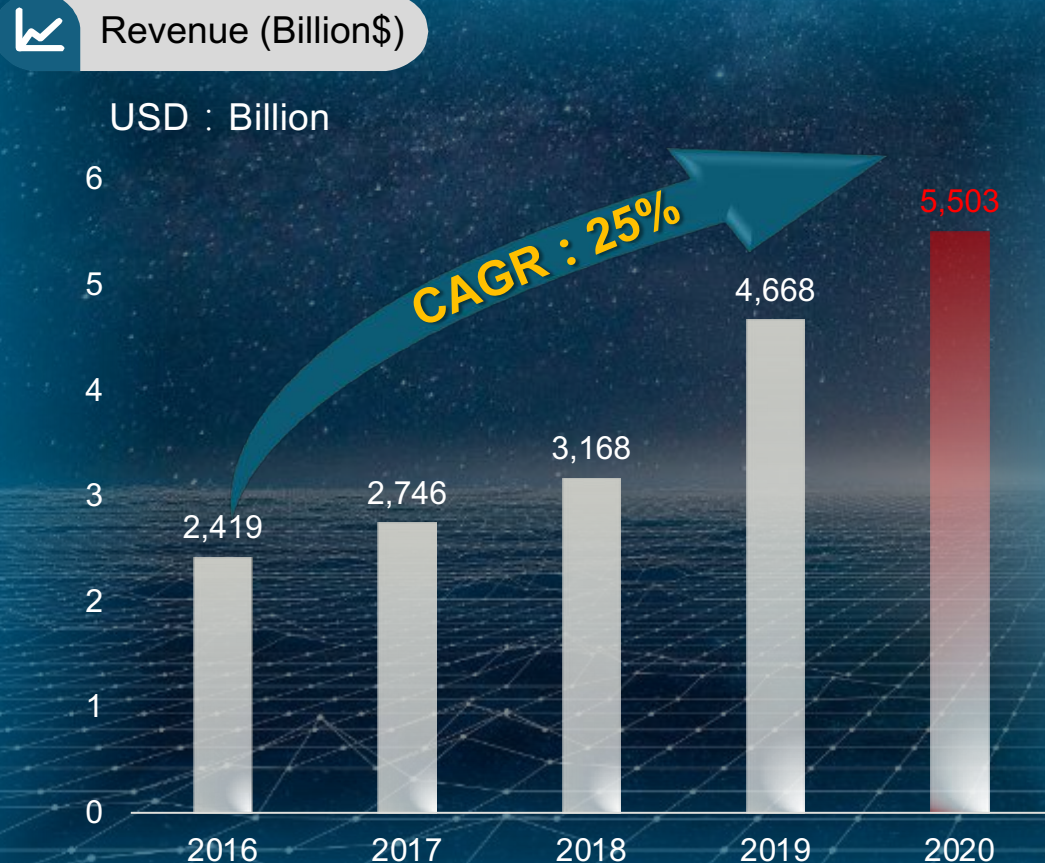


Smart Modular Prefabricated Datacenter 90s video



Continuous and high-speed growth, solutions are widely recognized in the industry

Huawei Digital Power sales revenue



Huawei Digital Power serves one third of the world's population across more than 170 countries and regions

Smart PV



No. 1 in the global market for six consecutive years. **175GW** smart PV plants Source 1

Data center facility



Prefabricated modular data center solution: No. 1 in the global market for six years. Smart module: No. 1 in the Chinese market for seven years Source 2

Site power



No. 1 for eight years since 2013, serving **170+** countries and regions Source 3

mPower



The world's first x-in-1 ePowertrain DriveOne

Embedded power



675+ Million PCS delivered

Source 1 : IHS Markit
Source 2 : Omdia
Source 3 : Frost & Sullivan

Huawei Green Data Center Proposition

Green Construction

Less resource footprint



- Quick TTM@ Prefab Modular DC
- Reduced resource footprint
- High recycling rate

Efficient Energy Usage

Low PUE&WUE



- Efficient power@simplified and converged solution
- Efficient cooling@freecooling and AI efficiency optimization

Green Data Center



Green Energy Supply

Renewable energy

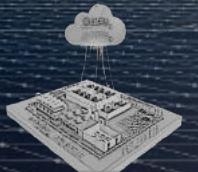
- Solar powered DC
- Multiple clean energy use
- Energy storage +DC



Smart Management

Carbon footprint visibility

- Digital Twins
- AI-enablement
- Energy Cloud



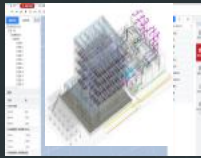
Green Data Center – Lifecycle Carbon Management , More than PUE

Reduce
Carbon
Emission



Visualize
Carbon
Footprint

Planning



- Digital planning
- Modular design

Construction

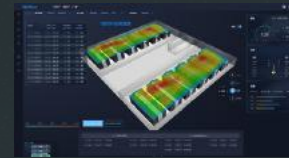


- Less resource
- Less waste

Operations & Maintenance & Optimization



- Less PUE&WUE
- More renewables



- Digital O&M
- Less manpower footprint



- Automatic optimization
- Smart recommendation

Recycling



- More material recycled
- Less waste disposal

Facility Deployment

- Construction resource consumption
- Construction waste

DC Operation

- PUE & WUE & CUE
- Resource utilization
- Efficiency
- O&M carbon footprint

Demolishing

- Recycling rate

Notes: PUE=Power Usage Effectiveness, WUE=Water Usage Effectiveness, CUE=Carbon Usage Effectiveness

The Journey so far.....

More than 1000 DC sites Build Experience

World's largest DC

UAE A100
1200+ Racks



Largest Carrier building DC

Central Plains Base
of China Unicom,
Henan , 21500 Racks



Largest Edge DC Contract

Philippines TNT
300+ EDC



Highest Altitude DC

China Mobile DC ,
Lhasa,Tibet, Altitude
3650m, 6600Racks



China Mobile of
Shanxi , 938 Racks
TTM 5M , including
building



First promise PUE DC

Southeast Information
Park , Fujian
2910 Racks,PUE1.39



Numerous Uptime Tier certification



Dubai Airports DXB MDCC



Nigeria Cloud Exchange Data Center



Batelco Hamala DC



Zero-carbon, the Main DC Development Trends

Zero Carbon



Elastic Expansion

The infrastructure will be elastic. The first-generation infrastructure matches the second-generation and third-generation IT power evolution



Simple Architecture

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

Simplified DC prefabrication



- Prefabrication delivery
- Full modular design: on-demand deployment

Simplified Power System



- Convergence and simplified
- Prefabricated Bus bar

Simplified cooling system



- Air in and water out / Free cooling
- Indirect evaporative cooling

AI Enabled

AI will gradually replace duplication of effort, expert experience, and business decision-making, Autonomous Driving Data Centers are coming

AI energy efficiency



- Energy efficiency diagnosis
- Energy efficiency optimization

AI operation



- AI unattended inspection
- AI Predictive Maintenance

AI management



- AI simulation
- AI service prediction

Key Driver for Success - Innovation

“0” wait time for rollout

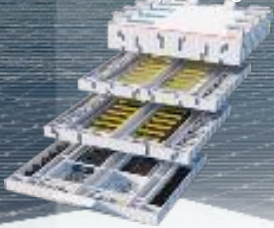
TTM 20 Months → 6~9 Months

Simple Reshape Architecture

Prefabrication : TTM20 Months->6~9 Months

Modular: On-demand deployment and phased investment

Elastic architecture: supporting IT evolution



“0” waste of energy

PUE1.45 → 1.15@Beijing

Green Reshape Cooling

AI energy saving: PUE1.45 -> 1.15, saving 40% water

Environment-friendly: less construction waste and no noise



“0” manual O&M

O&M costs reduced by 35%
Resource utilization improved by 20%

Smart Reshape O&M

AI-powered, Data-Center autonomous driving

AI intelligent inspection and operation
Comprehensive defense of software and hardware: 7 x 24h network security



“0” service interruption

Predictive Maintenance

Reliable Reshape Power

PowerPOD & SmartLi : ultimate reliability

AI Predictive Maintenance: Zero Service Interruption



FusionDC: Fully Modular and Prefabricated DC

Challenges



- The construction period of traditional data centers is long, which cannot meet service development requirements.
- In the context of carbon neutrality, building zero-carbon data centers has become a consensus.
- The actual PUE is often higher than the designed PUE.



Prefabricated Modular DC



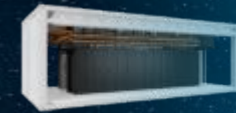
Full-stack convergence, build the DC you desire



Power Module



Cooling Module



IT module



Stair Module



Corridor Module



Office module

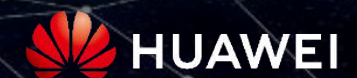
Traditional Solution

Prefabricated Modular Solution

Benefits

TTM	18 months	6 months	TTM 12 months earlier, resulting in an early revenue of \$18 million.
PUE	1.4	1.2	Energy saving by 14% and annual electricity cost saving by \$1.25 million
Recycle	< 30%	> 80%	Increases the recycle rate by 50% and reduces carbon emissions by more than 8000 tons.
ROI	8 years	6.8 years	1.2 years in advance
IRR	6%	9.5%	Increase by 3% +

Model: 1500 cabinets@Beijing, 8 kW/cabinet, 2N, 50% load, electricity fee: 0.12 \$/kWh, cabinet rental: 1000 \$/month



Modular UPS with SmartLi



3U

100 kW module



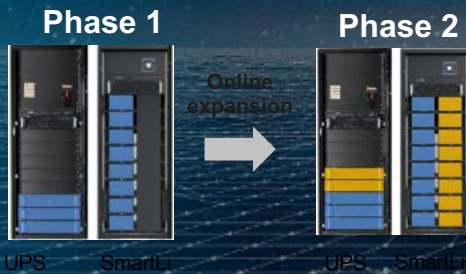
200~1600kVA
full-capacity coverage

- 1 MW One cabinet
- Intelligent online efficiency: 99.1%
- Redundancy of key components, zero single point of failure
- 5-minute module maintenance



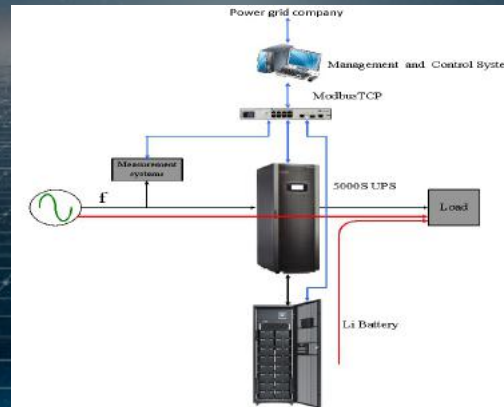
- Battery cell: LFP
- Typical backup time: 300KW@10 min/cabinet
- Fire extinguishing system: Module-level
- **Huawei UPS and third-party UPS/HVDC**

On-demand expansion

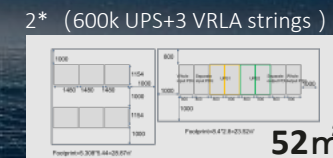


- Smart Li UPS Solution enables to start your DC from any capacity
- Protect your initial investment, power system grow with your business

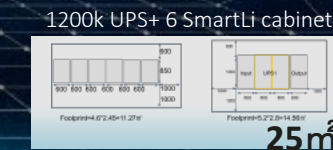
FFR Function



More IT Racks, More Revenue



VS

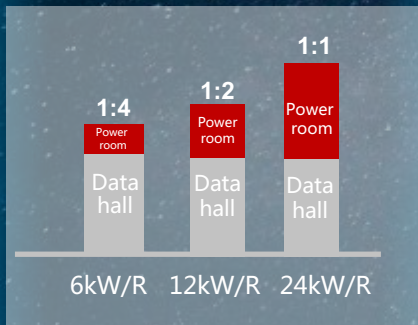


- Deploy extra 5 IT racks
- 10 years revenue from extra 5 racks:
 $900 * 5 * 12 * 10 =$
540,000 EUR

PowerPoD: Converged Power Supply, Super Efficiency 97.6%, Super Small Footprint reduce 40% Power Room Area

Challenges

Footprint of power room increase very fast



Low load rate, Low Efficiency

- load rate < 40%.
- Power system efficiency < 94%

Low reliability, difficult O & M

- 33% outages are caused by ower system
- low manual O & M efficiency, failure to identify potential risks

Traditional power system & lead-acid battery solution



Various devices and large area occupied, long term delivery and low efficiency

PowerPOD & SmartLi solution



Full-chain convergence, highest power density, AI-powered, most reliable

Traditional solution

Installation area	1800 m ²	1100 m ²
Delivery Time	2 months	2 weeks
Efficiency	94%	97.6%
Reliability	Large number of dumb devices, high risks	AI enablement

Huawei

Reduces the area by 40%, deploys additional 200 IT cabinets, and generates more revenue of 3M\$ per year.

Save 75% time

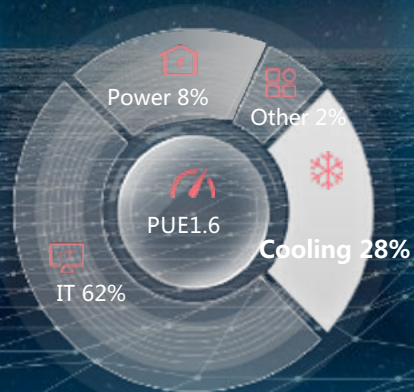
Power cost saving: 0.3M \$/ year

From passive to active prediction (200+ sensor Temperature monitoring, AI low-load temperature rise warning, component life prediction, online switch setting, and sound & image AI recognition)

EHU: Fastest Delivery in the Industry, Optimal Energy Efficiency @AI

Challenges

- The data center consumes high energy, but the cooling system contribute a high percentage.
- In the context of carbon neutrality, policies have been issued around the world to increase the PUE threshold, and low PUE has become a basic requirement for DC construction.



Maximize the use of natural cold sources @AI

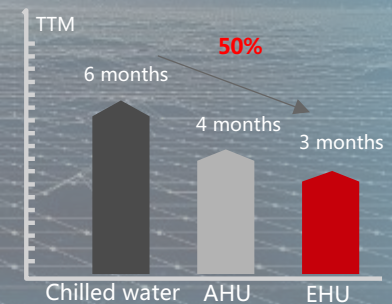
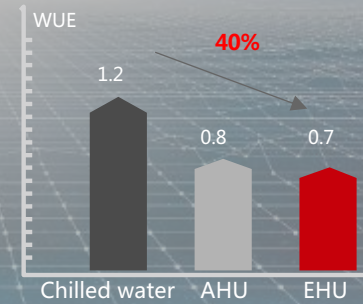
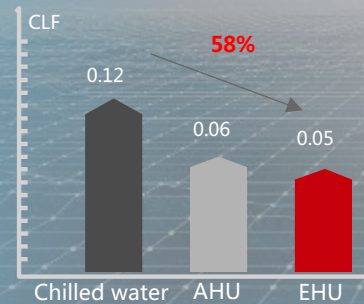
Traditional chilled water



AHU

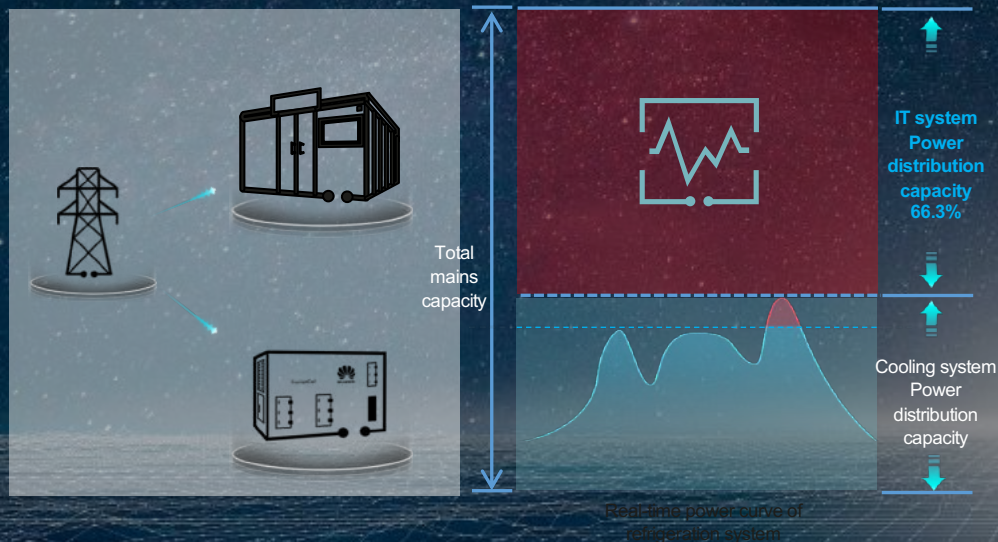


EHU (400kW/260kW)



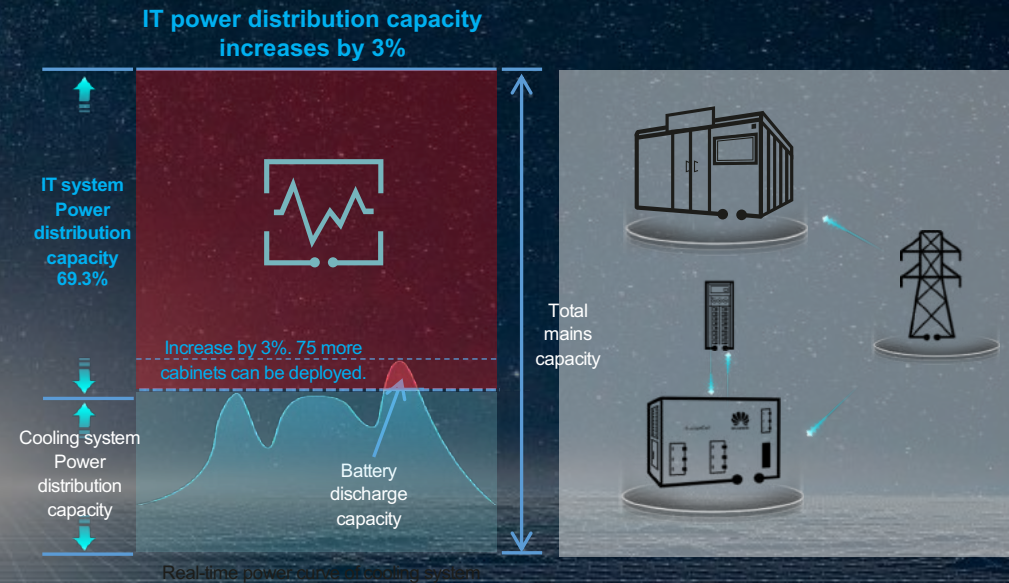
EHU: Improves the Data Center Power Utilization Rate

Traditional power supply architecture, cooling peak power restricts IT power capacity



- The cooling power distribution capacity needs to be reserved based on the peak power of all working conditions.
- The hybrid mode has a high peak power, which restricts the available power capacity of the IT system (GUE 66.3%).

EHU: The energy storage system adjusts the peak cooling power to improve power utilization



- Peak power regulation through energy storage system, which allows more power capacity to be allocated to IT systems
- The GUE is increased by 3% (from 66.3% to 69.3%), and the revenue is increased by 0.6 MUSD/ year.

Model: 1500 cabinets, 8 kW/cabinet, 50% load rate @ Beijing, 0.12 €/kWh, GUE = Total IT designed power / total mains capacity

Model: 1500 racks, 11 load, 8 kW/R, 2N architecture, load rate 50%, electricity fee: 0.12 \$/kWh, water fee: 0.5 \$/ton, and rent: 1000 \$/month

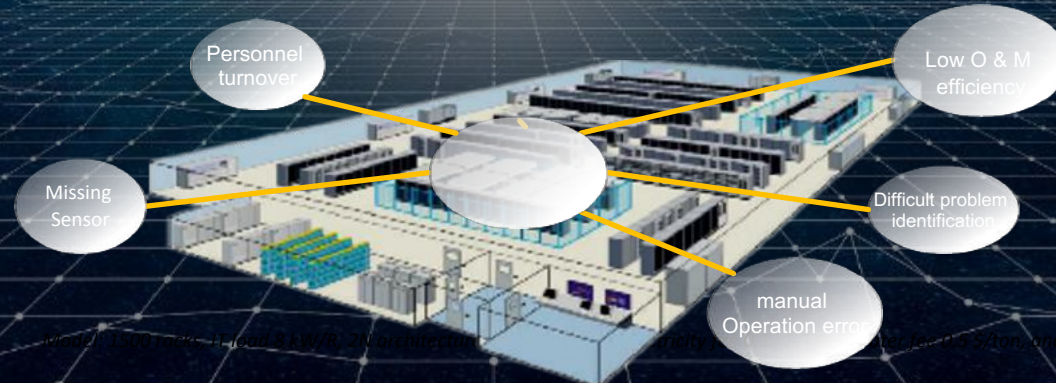
Model: 1500 cabinets, 8 kW/cabinet, 2N, 50% load @ Beijing, electricity fee: 0.12 \$/kWh, water fee: 0.7 \$/kWh/ton

AI Energy Optimization : from manual Optimization to Intelligent

Manual Optimization



AI Energy Efficiency Optimization: iCooling



Digital Twin + AI + Energy Cloud

Visualized carbon footprint
@Energy Cloud

Energy Cloud

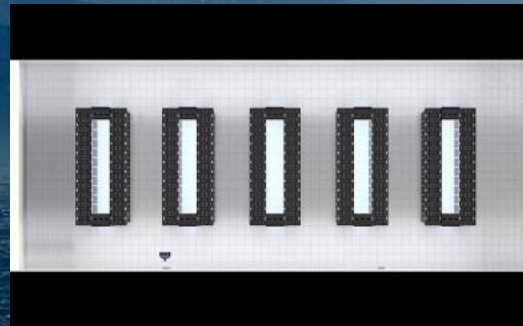
Intelligent Visualization @
Digital Twins

Millions of monitoring points



Auto Maintenance
@ AI

↓35% O&M cost



Smart Operation
@ AI

↑ 20% resource utilization rate



Energy Efficiency
Optimization @ AI

PUE ↓8%~15%



BIM+
DCIM



3D All-link
Visualization



All-view
Dashboard



E-process



Digitalization



Smart



All-life
Asset Mgt.



Smart
Capacity Mgt.



Big Data
Analysis



Efficiency
Diagnosis



AI-enabled
Optimization



Data center facility: simple, green, smart and reliable



Prefabricated modular DC

Outdoor data center



From traditional building to Lego-style architecture

One floor for one DC, the delivery consistent with actual design, 1000 racks within 6 months

Smart modular DC

Indoor data center



From modular to intelligent

Any room can be a Data Center, one module for one DC

Smart power

From distributed components to converged power supply



Ultra-high reliability, density and efficiency

Smart cooling

From chilled water to natural cooling sources



Maximizing natural cooling sources @ AI

Smart O&M

From manual O&M to smart O&M



Security and reliability, autonomous driving

Model: 1500 cabinets, 8 kW/cabinet, 2N, 50% load @ Beijing, electricity fee: 0.12 \$/kWh, water fee: 0.7 \$/kWh/ton



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

Digital Power: Your Best Partner for a Better, Greener Future

_____ By June 30, 2021, Digital Power has helped _____ customers

generate green power

save power

reduce carbon emissions

equivalent to planting

403.4 billion kWh

12.4 billion kWh

200 million tons

270 million trees



Conversion note:

Note 1: Conversion coefficient of electricity carbon emissions – 1 kWh electricity is equivalent to 475 g CO₂ (global average).
Source: International Energy Agency (IEA) Global Energy & CO₂ Status Report 2018

Note 2: Lifetime CO₂ absorption of trees (equivalent number of planted trees) – A tree absorbs 18.3 kg of CO₂ a year, and each tree has a 40-year lifespan.
Source: Open data of the North Carolina State University website