ITU Dialogue on Sustainable Digital Transformation in Asia and the Pacific

Liquid Cooling for Sustainable Digital Infrastructure in China

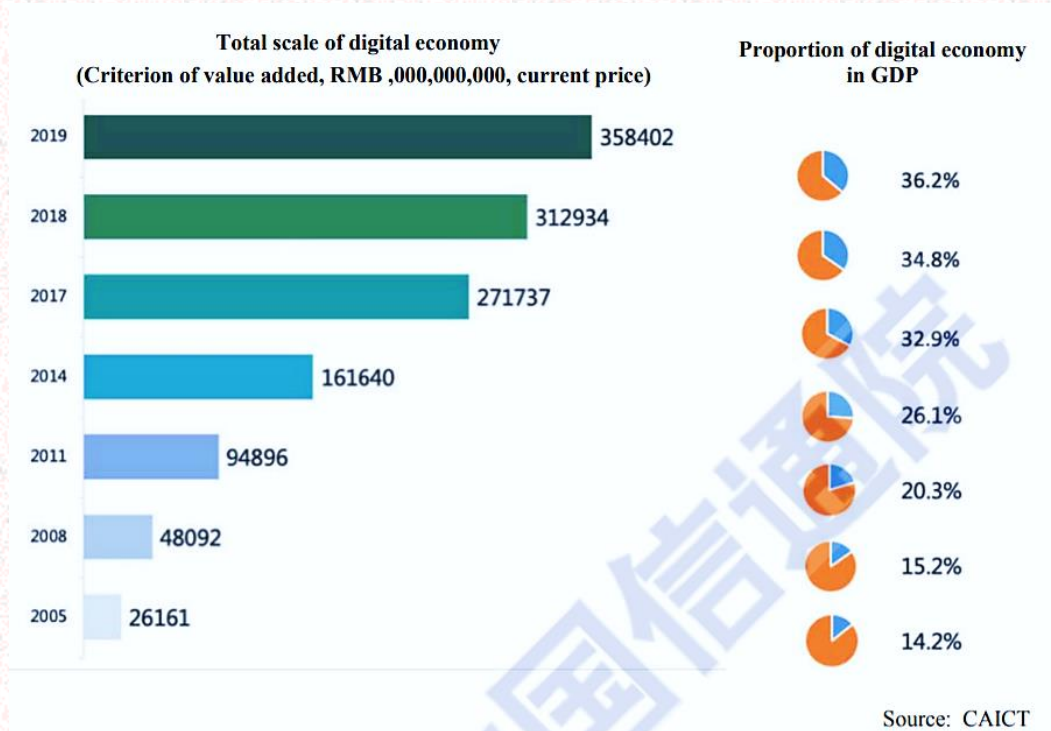**Xiao Wang 王潇**
UNEP DTU Partnership, Copenhagen Centre on Energy Efficiency
19th October, 2021
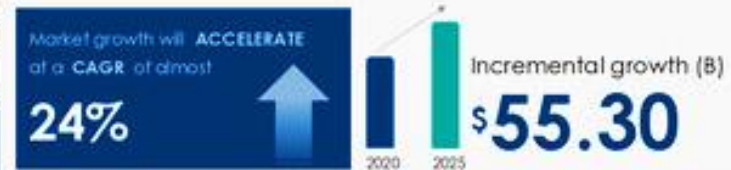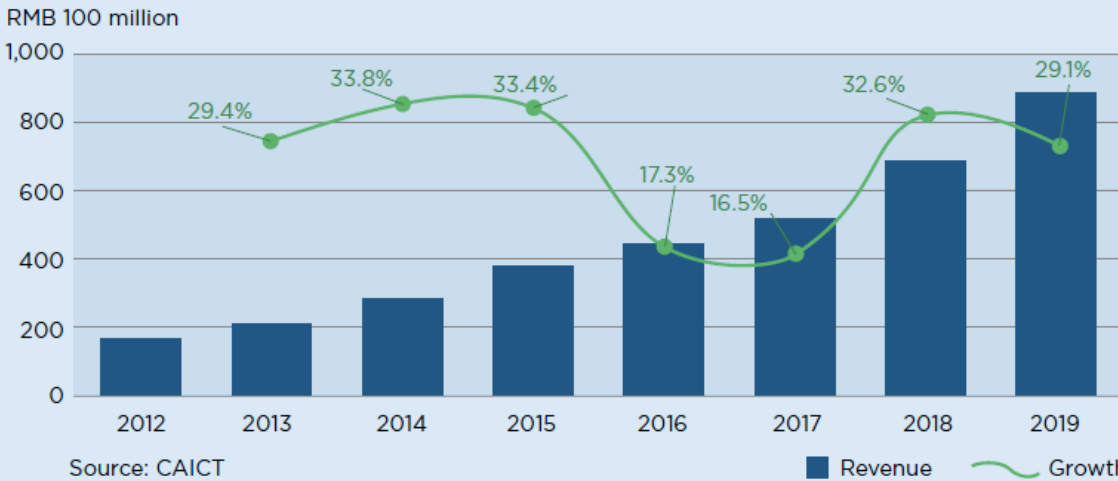
How big is China's digital economy?

China has built the world's largest optical fiber and 4G and 5G mobile broadband networks, with the number of 5G terminal connections exceeding 365 million.
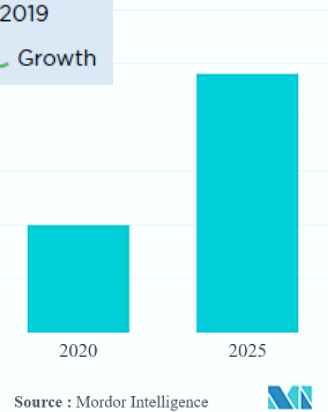

Total scale of digital economy
(Criterion of value added, RMB ,000,000,000, current price)

Year	Value
2019	358402
2018	312934
2017	271737
2014	161640
2011	94896
2008	48092
2005	26161

Proportion of digital economy in GDP

	36.2%
	34.8%
	32.9%
	26.1%
	20.3%
	15.2%
	14.2%

Source: CAICT

China's digital economy kept a high growth rate of 9.7 percent in 2020 amid the pandemic and global economic downturn.

China Data Centre Development


Figure 1. 2012-2019 IDC revenue and growth in China

RMB 100 million

Year	Growth
2013	29.4%
2014	33.8%
2015	33.4%
2016	17.3%
2017	16.5%
2018	32.6%
2019	29.1%

Source: CAICT

Revenue — Growth

Market growth will **ACCELERATE** at a **CAGR** of almost **24%**

Incremental growth (B) $**55.30**

Growth for 2021 **20.81%** **100%** Of growth will come from **CHINA**

The market is **FRAGMENTED** with several players occupying the market

-center-market_Market Summary

Study Period:	2018 - 2026
Base Year:	2020
CAGR:	19.2 %

Source : Mordor Intelligence

■ 图 7 - 未来 5 年（2019-2023 年）中国数据中心机架数和能耗预测

Legend: 总能耗（亿千瓦时）; 机架数（万个）
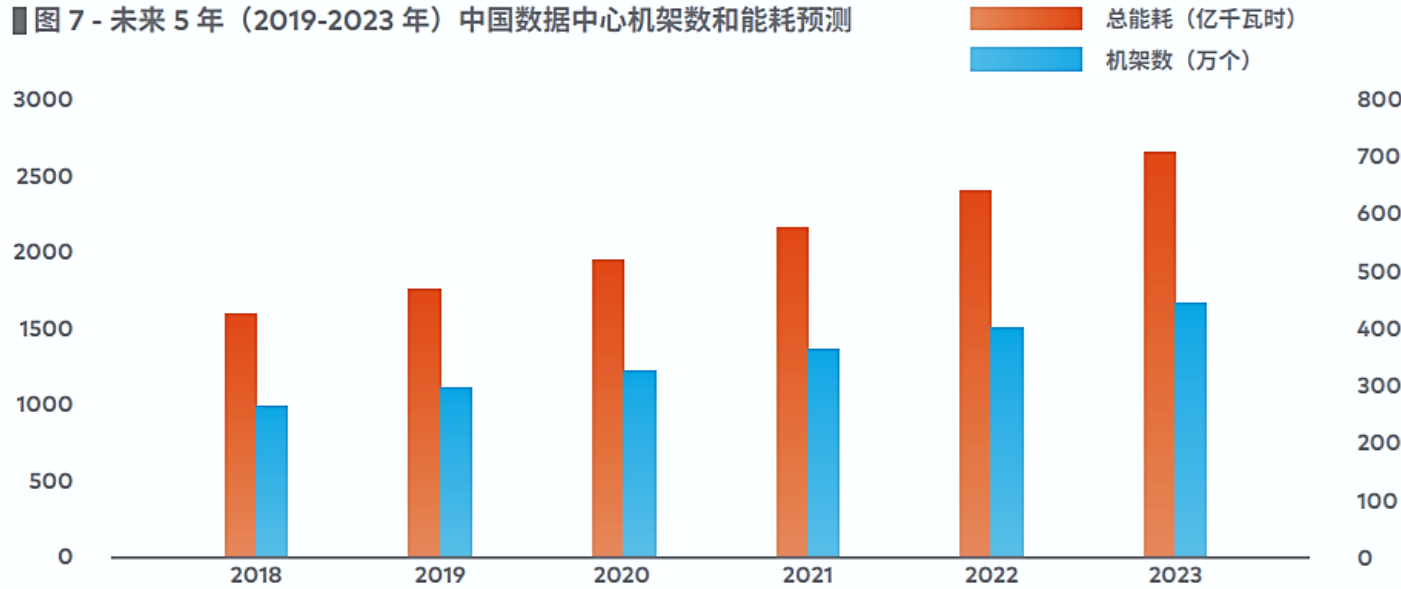
Source:Greenpeace and North China Electric Power University

Global electricity demand

Other demand

2015
Best case 2030
Expected 2030
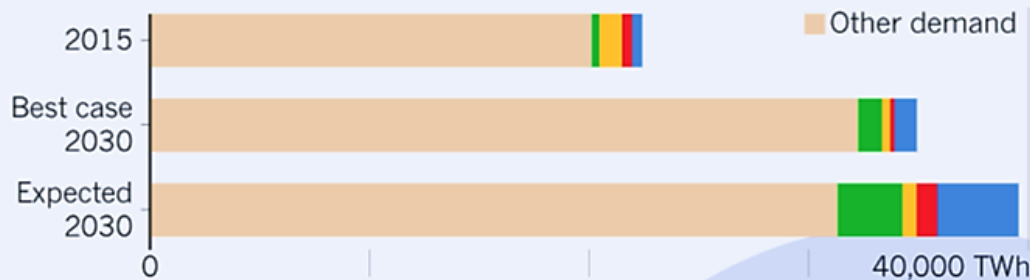
0 — 40,000 TWh

Source: Andrae/Nature.com

ENERGY SCALE

Global electricity demand	Electricity use by ICT
20,000 TWh	**2,000** TWh
Data-centre electricity demand	Bitcoin use by mid-2018
200 TWh	**20** TWh

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Figures are approximate.

Sources: IEA/A. Andrae/Ref. 6

Liquid cooling as a mitigation solution

Figure 2. Liquid cooling general circuit

BUILDING

FREEZING STATION

IT ROOM

Heat Removal Equipment

Chiller

Cooling unit (optional)

Liquid Cooling Cabinet

Cooling water system

Chilled water (primary circuit)

Process refrigerant system (secondary circuit)
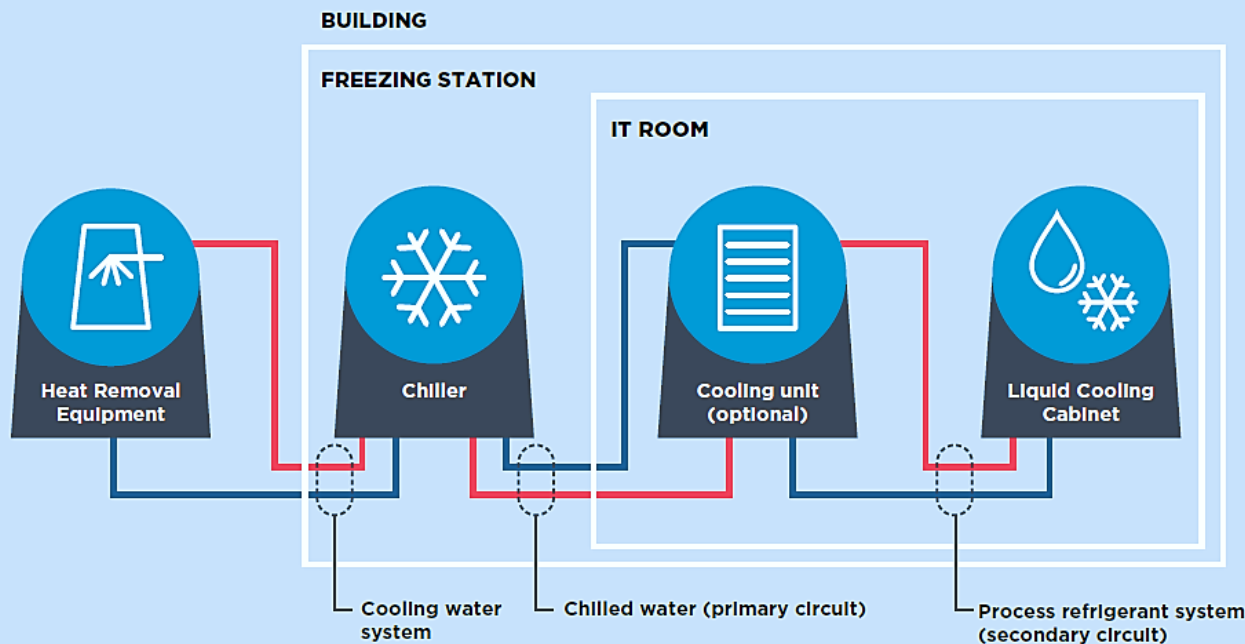
In the data-centre field, mainframe computers have used this technology since the 1960s.

A liquid circuit in which the cooling liquid exchanges heat with the components.

Liquid cooling provide effective heat dissipation, reduce energy consumption, improve energy efficiency and reduce noise pollution.

At present, liquid-cooling solutions mainly use one of three technical routes: cold-plate liquid cooling, immersion liquid cooling and spray liquid cooling.

China Liquid Cooling Case Study

Figure 4. Alibaba Winter Olympics Cloud Data Centre (source: Alibaba)

A single-phase immersion liquid-cooling server cluster in its 2MW power capacity.

As the per-unit computing capacity is increased more than tenfold.

In terms of physical space, the immersion liquid-cooling solution can save 75% of the surface occupied by IT equipment.

Taking southern China as an example, compared with the PUE1.5 air-cooled data centre, the energy consumption of a liquid-cooled data centre of the same size can be reduced by more than 35%. In other words, when 100,000 servers are running, about 235 million kWh of electricity and 200,000 tons of carbon dioxide emissions can be saved each year.

Thank you!

https://c2e2.unepdtu.org/sustainable-datacentres-and-ict/