

Global Overlook of Energy Efficient Internet Data Centres (IDCs)

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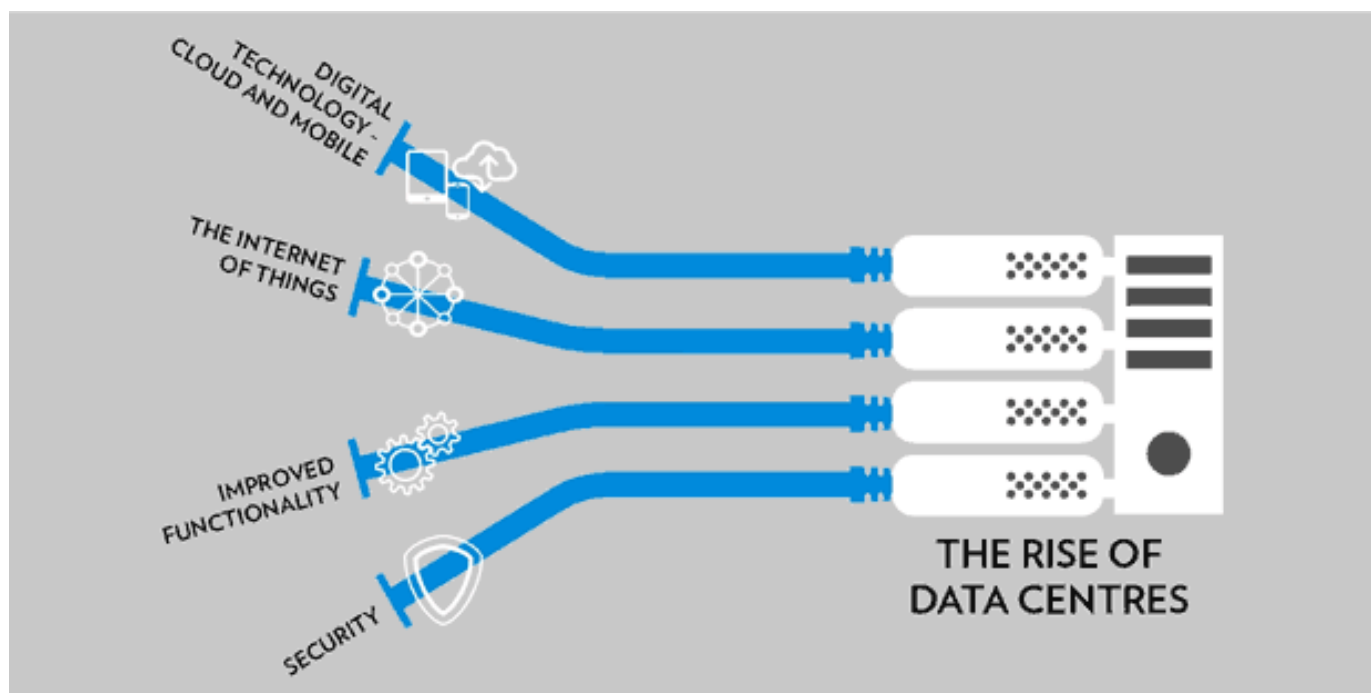
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Copenhagen Centre on Energy Efficiency

The Rise of Internet Data Centres (IDCs)

- Digital Technology – Cloud and Mobile
- The Internet of Things (IoT)
- Improved Functionality
- Security



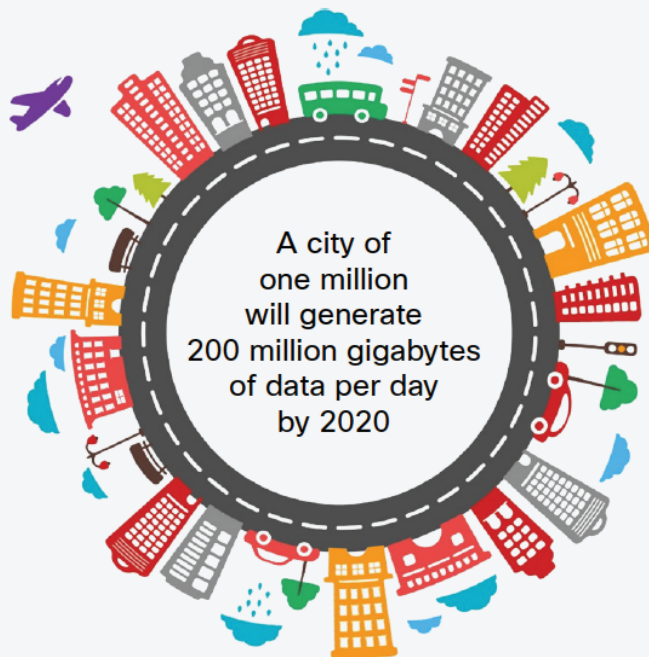
OVERVIEW

RISE OF INTERNET DATA CENTRES

The Rise of Internet Data Centres (IDCs)

- Global visualization and big data

What Makes a Smart City?
Multiple Applications Create Big Data



Connected Plane

40 TB per day (0.1% transmitted)

Connected Factory

1 PB per day (0.2% transmitted)

Public Safety

50 PB per day (<0.1% transmitted)

Weather Sensors

10 MB per day (5% transmitted)

Intelligent Building

275 GB per day (1% transmitted)

Smart Hospital

5 TB per day (0.1% transmitted)

Smart Car

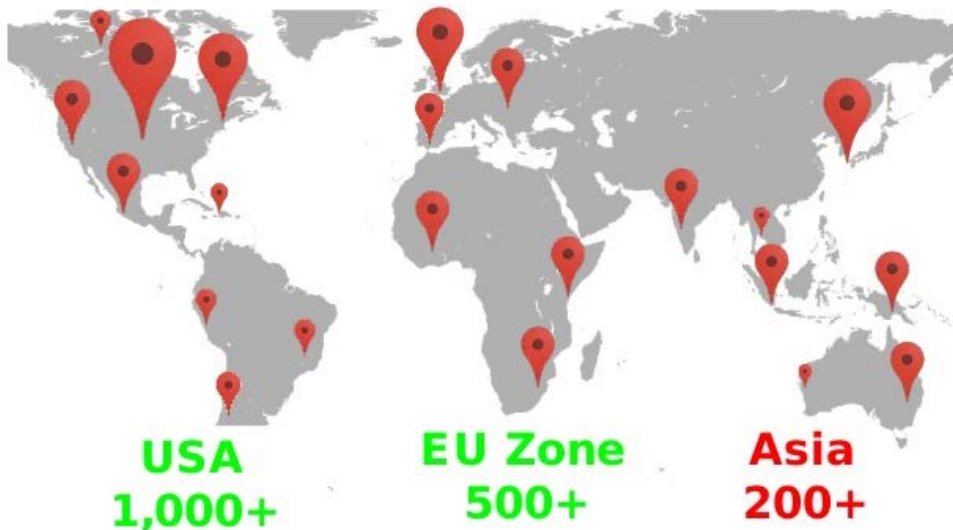
70 GB per day (0.1% transmitted)

Smart Grid

5 GB per day (1% transmitted)

Source: Cisco Global Cloud Index, 2015-2020

INTERNET DATA CENTRE (IDC) DEVELOPMENTS IN THE WORLD



IDCs are everywhere:

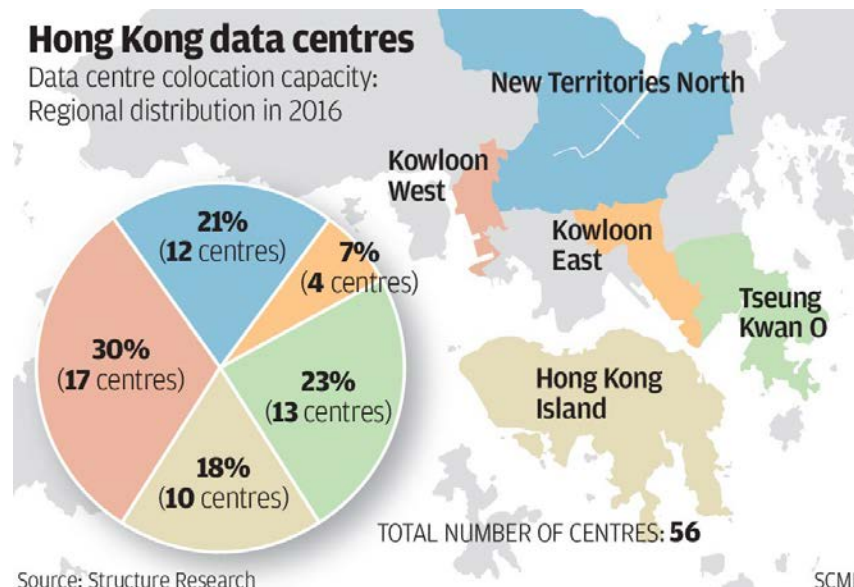
- The mapping of IDCs in 2013 showed they are expanding
- No matter in big countries like USA, or small regions like Hongkong. We are well connected by IDCs



(Data Center Map, 2013)

Hong Kong data centres

Data centre colocation capacity:
Regional distribution in 2016



Source: Structure Research

SCMP

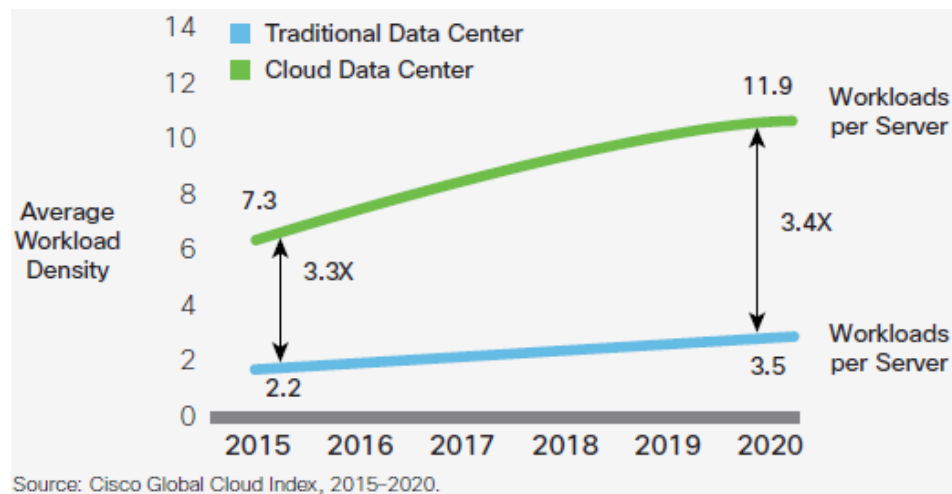
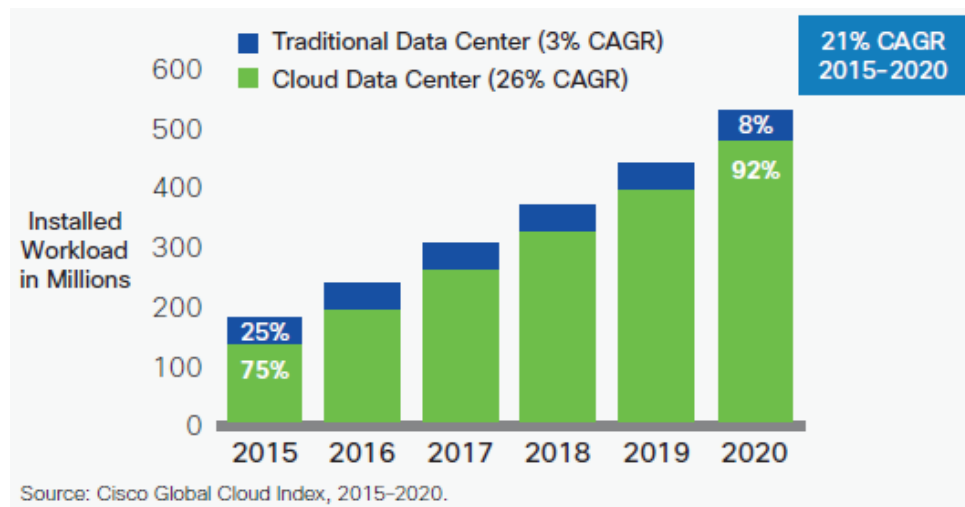
IDCs by fiber optics connections

Source: Fiber Locator / Sugarloaf Associates LLC

INTERNET DATA CENTRE (IDC) DEVELOPMENTS IN THE WORLD

Higher workloads in IDCs

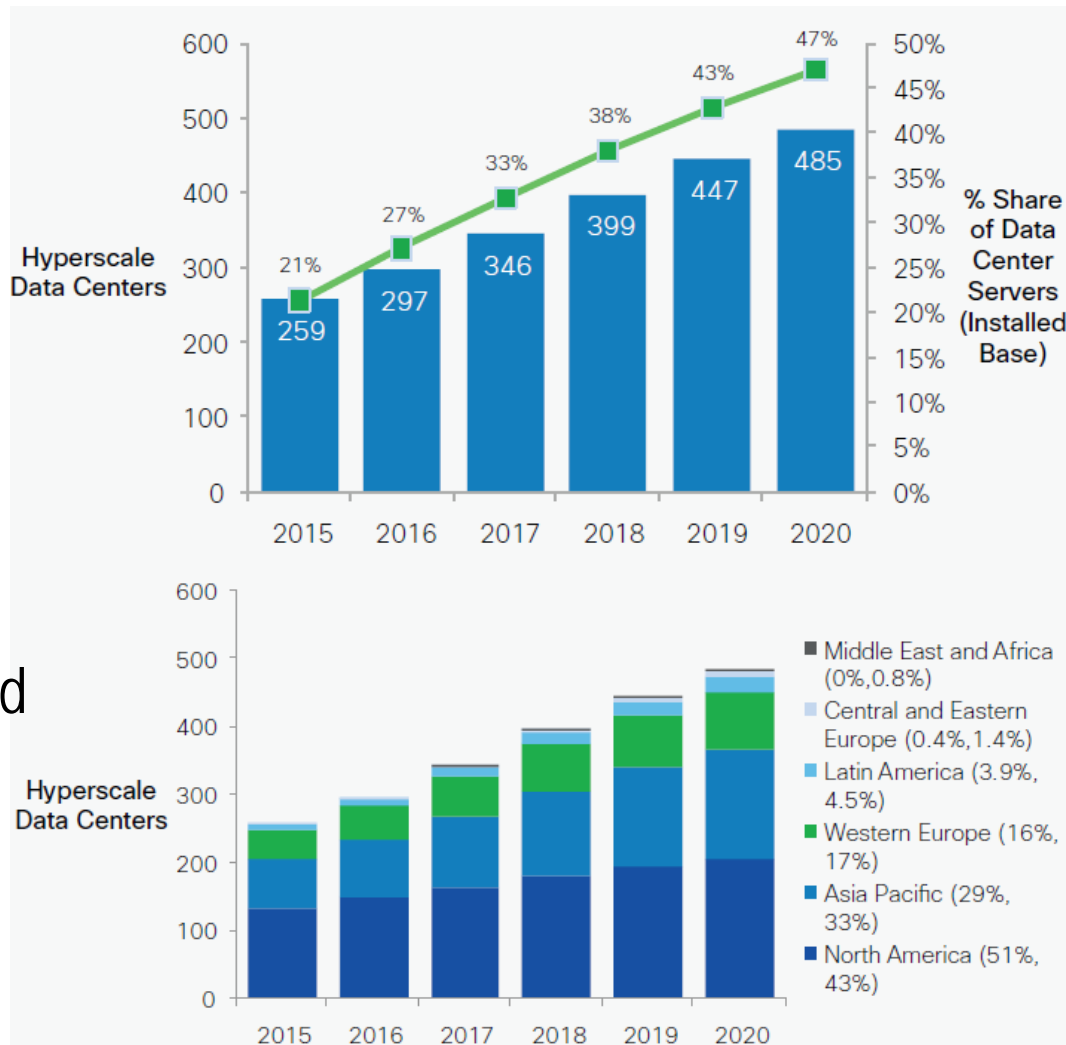
- Workloads: By 2020, 92 percent of workloads will be processed by cloud data centers or IDCs.
- Workload density: grow from 7.3 in 2015 to 11.9 by 2020



INTERNET DATA CENTRE (IDC) DEVELOPMENTS IN THE WORLD

Hyperscale IDCs

- Hyperscale data centers will grow from 259 in number at the end of 2015 to 485 by 2020.
- They will account for 83 percent of the public cloud server installed base in 2020 and 86 percent of public cloud workloads.



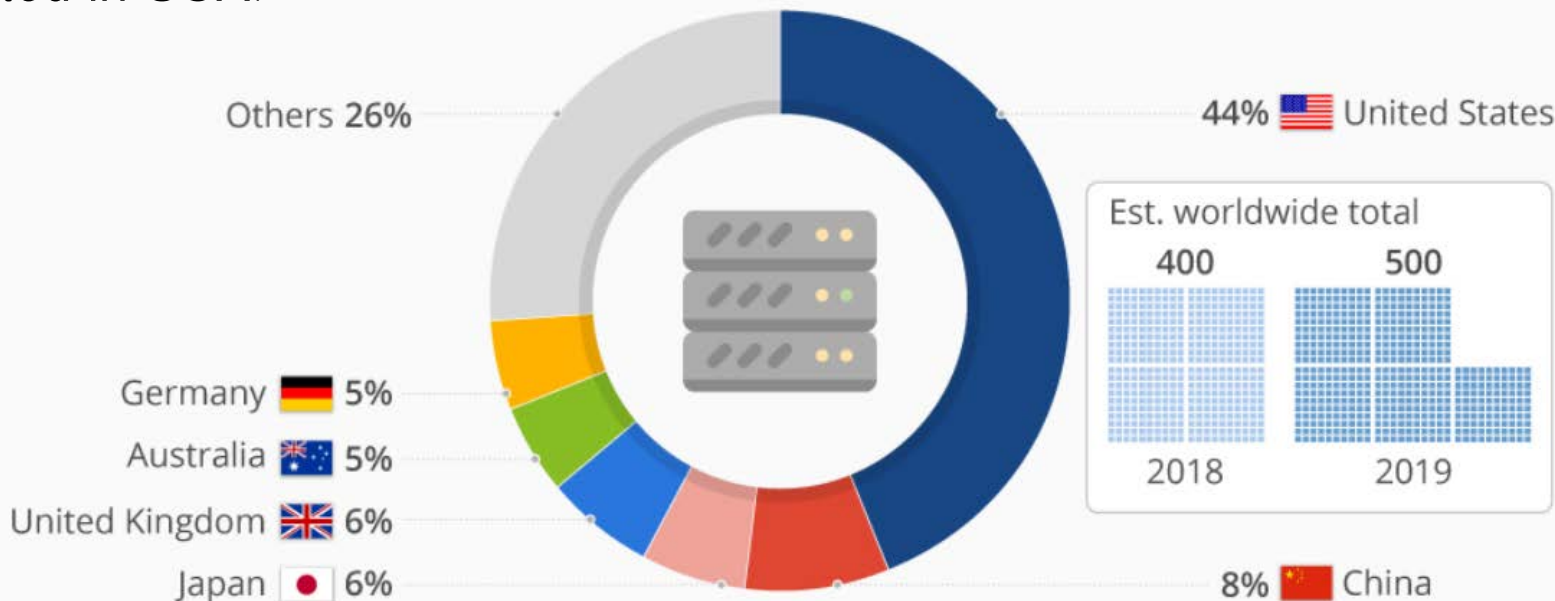
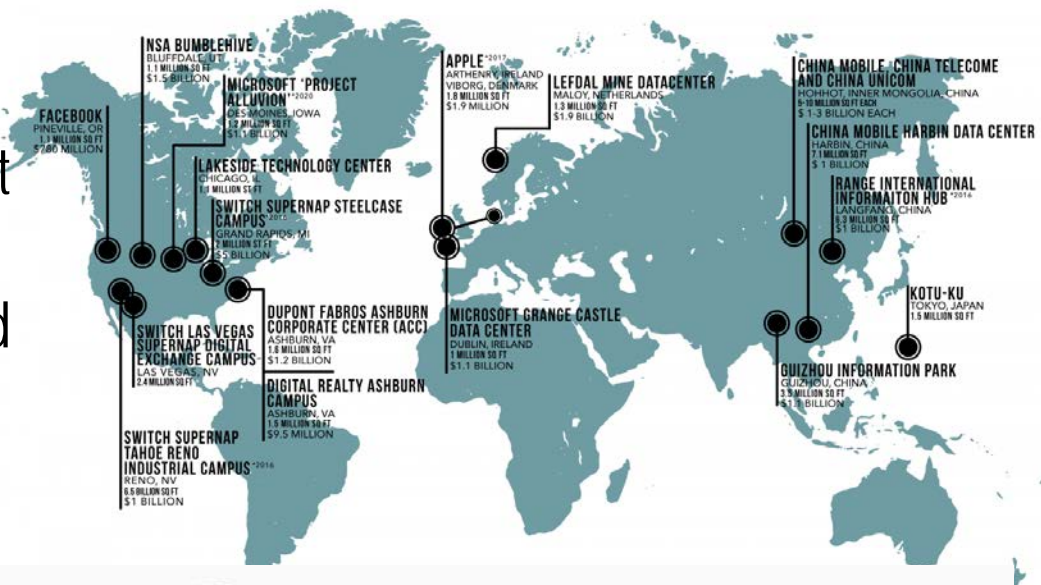
Note: Percentages within parentheses refer to relative share for 2015 and 2020.

Source: Cisco Global Cloud Index, 2015–2020; Synergy Research.

INTERNET DATA CENTRE (IDC) DEVELOPMENTS IN THE WORLD

Hyperscale IDCs

- Hyperscale IDCs with largest in size and fastest in computing speed are located all over the world.
- 44% of hyperscale IDCs are located in USA.



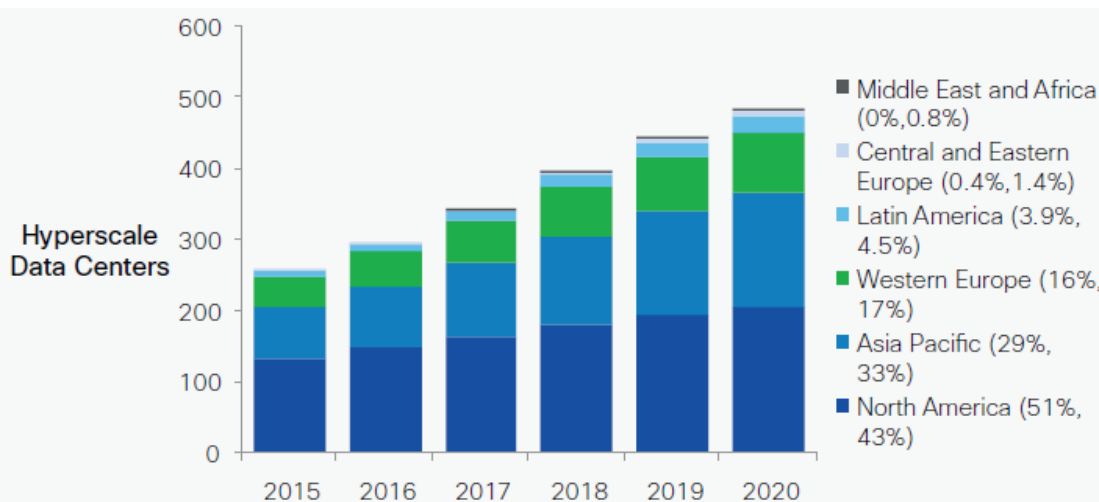
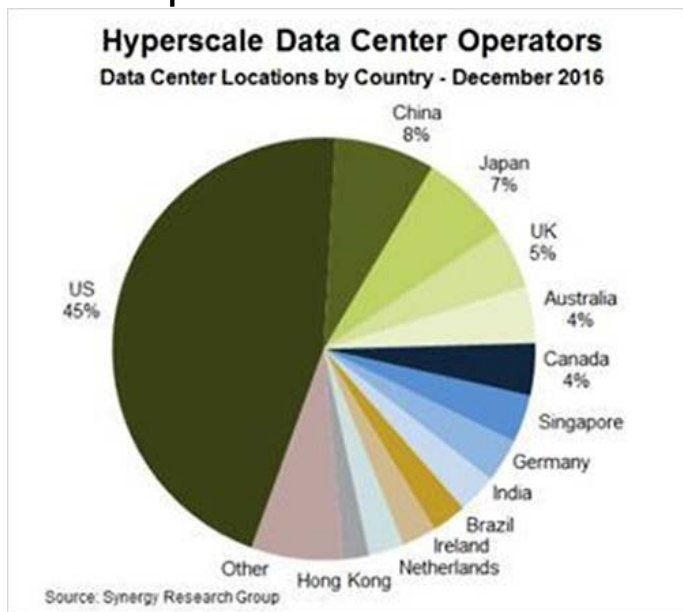
INTERNET DATA CENTRE (IDC) DEVELOPMENTS IN THE WORLD

Hyperscale IDCs

- They will represent 47 percent of all installed data center servers by 2020.
- Mainly located in North America, Asia and Western Europe.

By 2020, Hyperscale Data Centers Will House:		Today:
47%	of all data center servers	21%
68%	of all data center processing power	39%
57%	of all data stored in data centers	49%
53%	of all data center traffic	34%

Source: Cisco Global Cloud Index, 2015-2020.



Note: Percentages within parentheses refer to relative share for 2015 and 2020.

Source: Cisco Global Cloud Index, 2015-2020; Synergy Research.

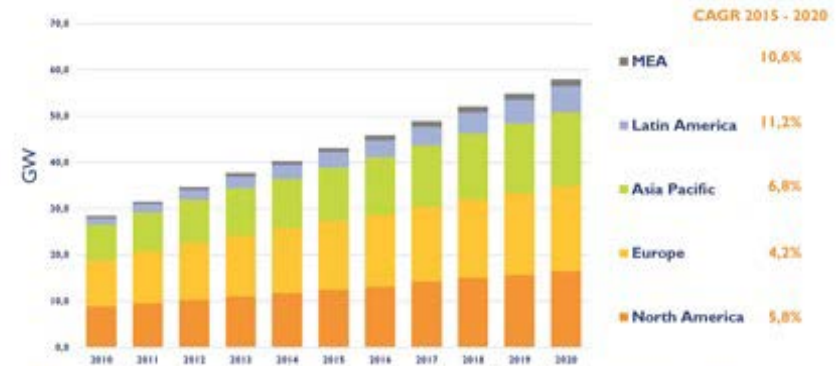
INTERNET DATA CENTRE (IDC) ENERGY CONSUMPTIONS

Electricity

- The electricity capacity for IDCs will increase around 25-30%, comparing 2020 to 2016
- For the cases in USA, electricity consumption of hyperscale IDC double, comparing 2020 to 2016

WORLDWIDE DATA CENTER FACILITIES – POWER NEEDS IN GW

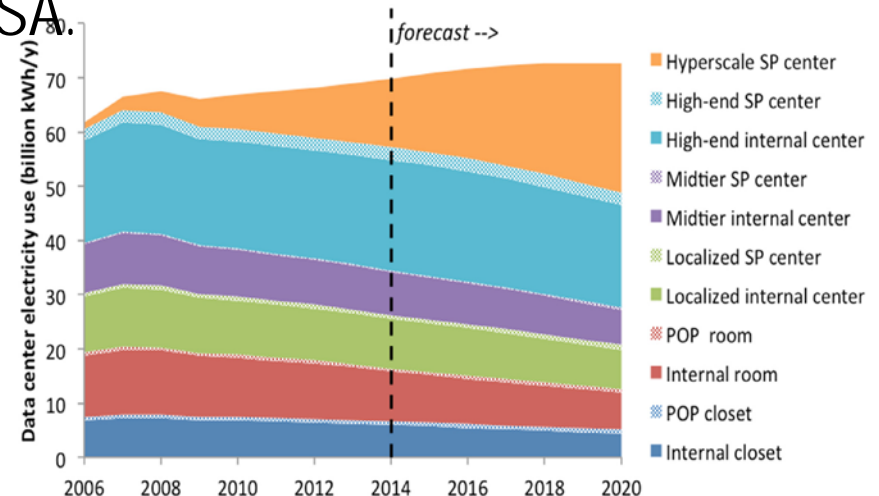
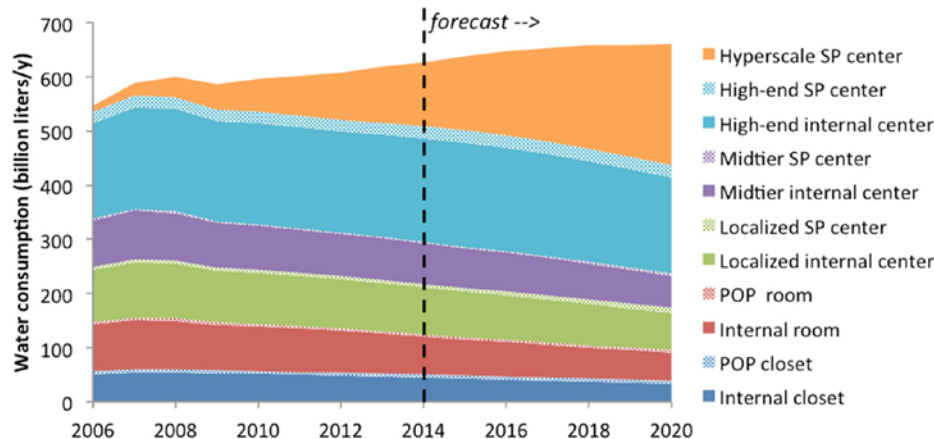
(Source: New Technologies and Architectures for Efficient Data Center report, July 2015, Yole Développement)



With no slowdown in new facility construction, data centers worldwide will have an increasing need for power.

Water

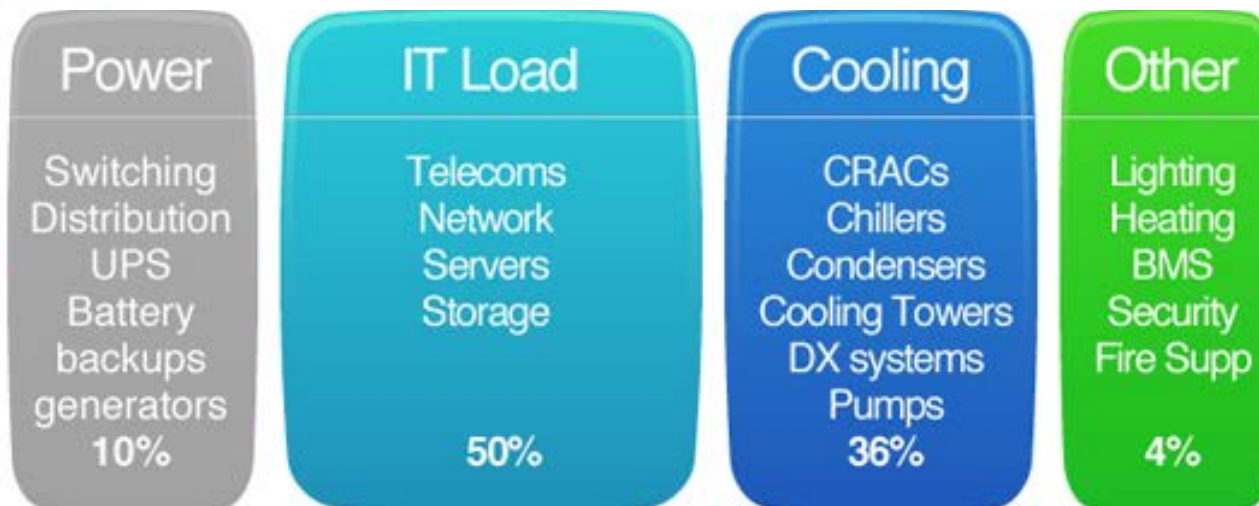
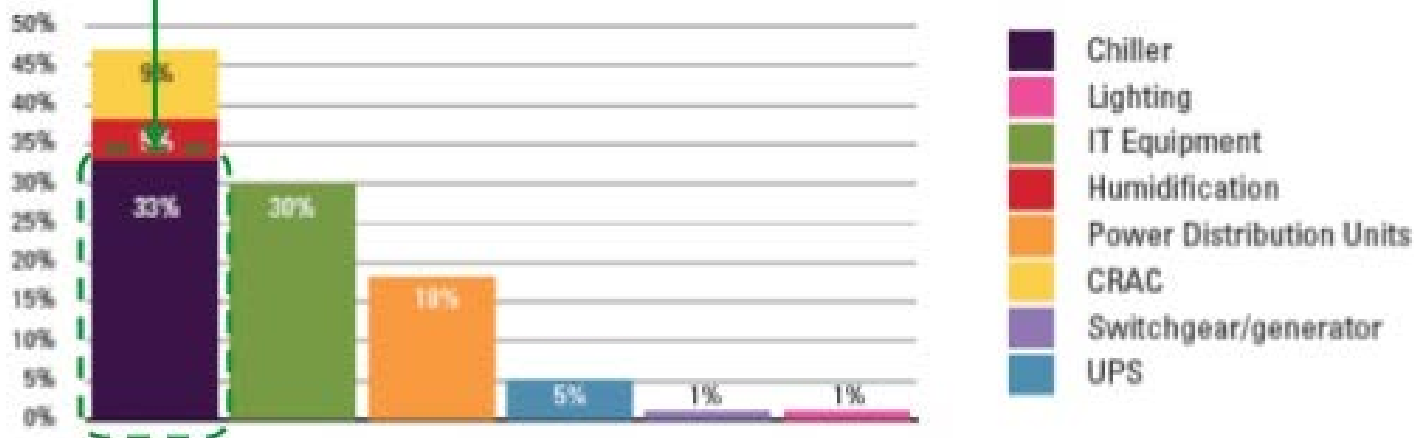
- Total water consumption in IDCs in USA.



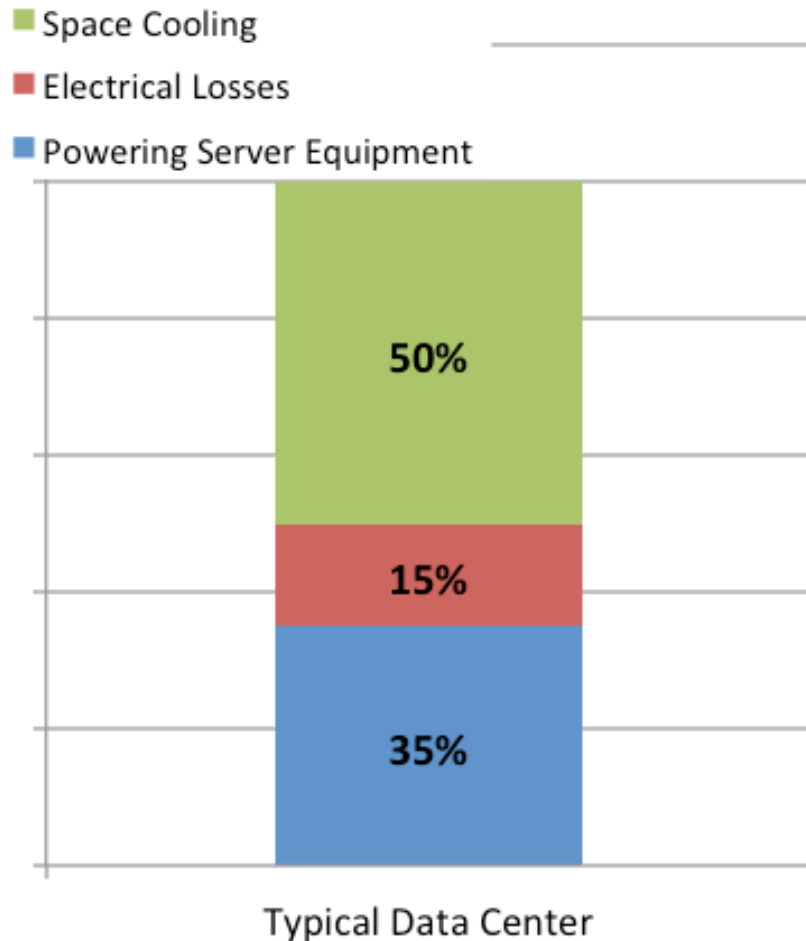
INTERNET DATA CENTRE (IDC) ENERGY CONSUMPTIONS

33% of the total energy consumption is related to the chillers

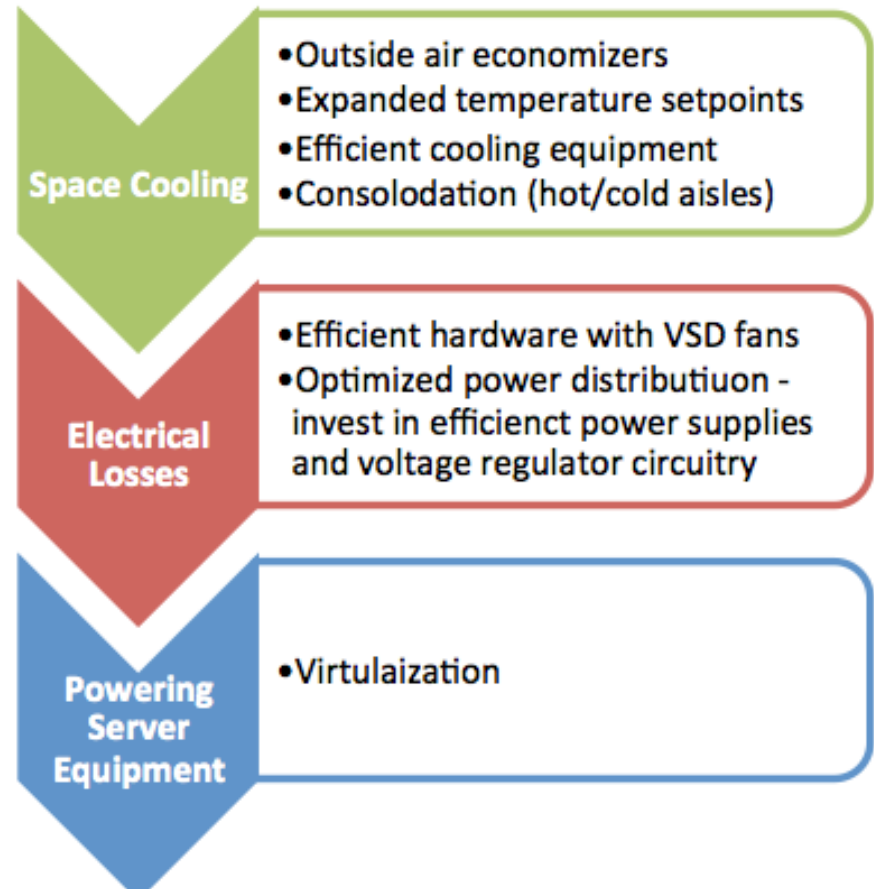
Power consumption in a Data Center



INTERNET DATA CENTRE (IDC) ENERGY CONSUMPTIONS



Efficiency Strategies



INTERNET DATA CENTRE (IDC) ENERGY CONSUMPTIONS



COPENHAGEN CENTRE
ON ENERGY EFFICIENCY
SEforALL EE HUB



Energy efficiency trends

- The energy efficiency of IDCs is expected to improve at least 5% annually.
- The expected average efficiency will improve from 0.135 kWh/GB in 2010 to 0.014kWh/GB
- Need to use renewable energy, high-efficient IT hardware and innovative cooling technologies.

Electricity usage (TWh) of Data Centers 2010-2030

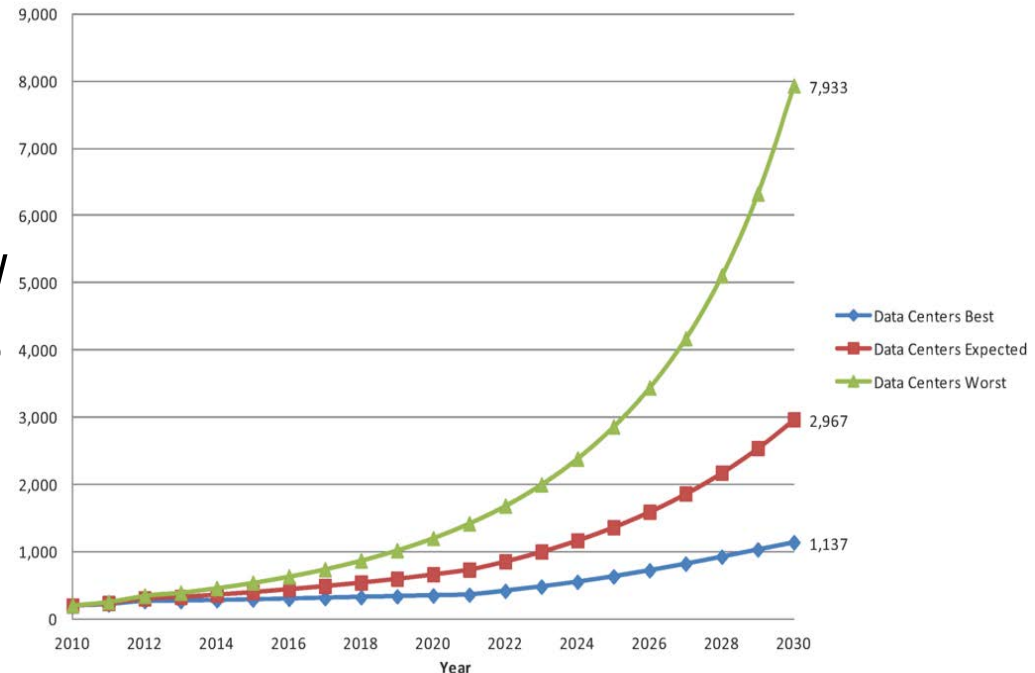


Table 2. Electricity intensity roadmap for networks and data centers 2010, 2020 and 2030.

	2010 (kWh/GB)	2020 (KWh/GB)	2030 (KWh/GB)	Reduction of electricity intensity 2030 compared to 2010
FAN wired	0.50	0.11–0.28	0.061–0.17	66%–87%
FAN Wi-Fi	0.36	0.07–0.17	0.014–0.10	72%–96%
WAN	6–15	0.047–1.04	0.002–0.048	>99%
Data centers	0.13–0.14	0.027–0.085	0.014–0.051	64-89%

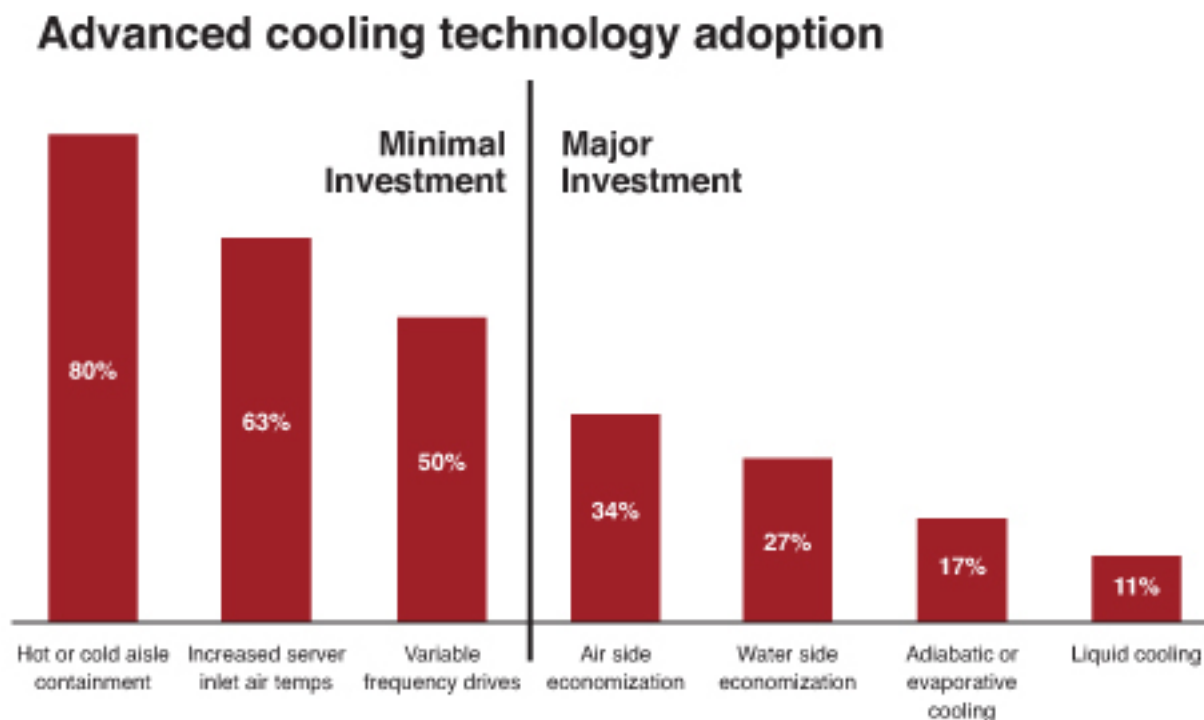
Source: On Global Electricity Usage of Communication Technology: Trends to 2030

<https://www.mdpi.com/2078-1547/6/1/117/htm>

POTENTIAL ENERGY EFFICIENT TECHNOLOGIES IN IDC

Cooling systems

- Even though understood the importance of efficiency, more IDCs are tackling inefficient cooling systems in IDCs, when considering investment

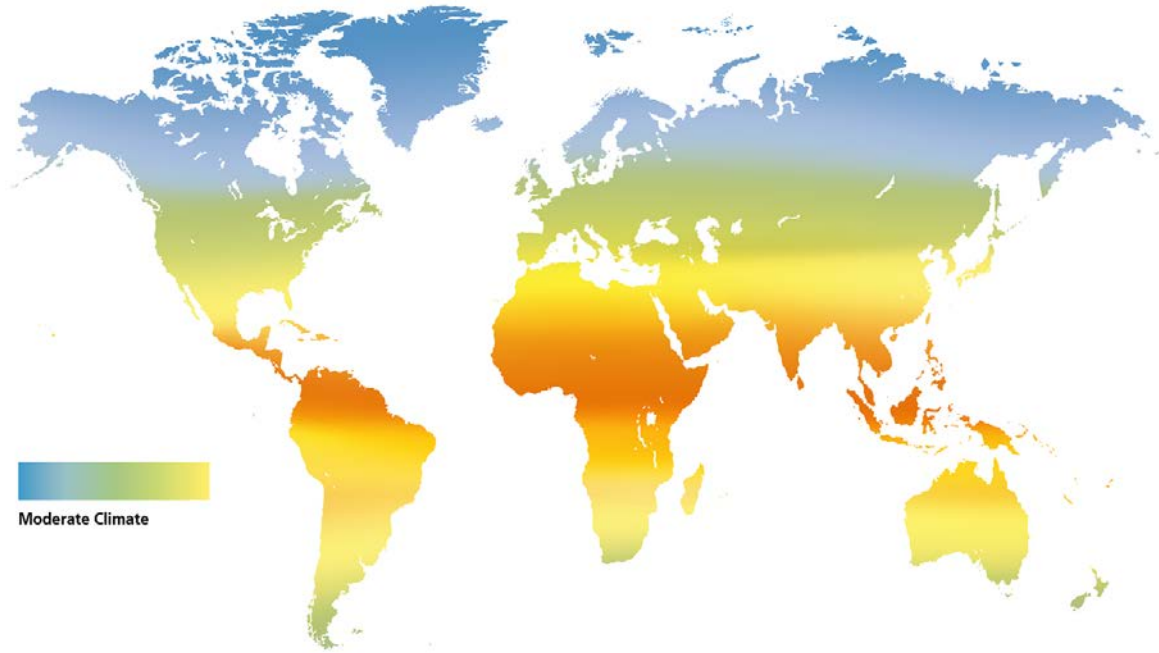


Source: Uptime Institute
Data Center Industry
Survey 2014

POTENTIAL ENERGY EFFICIENT TECHNOLOGIES IN IDC

Free cooling

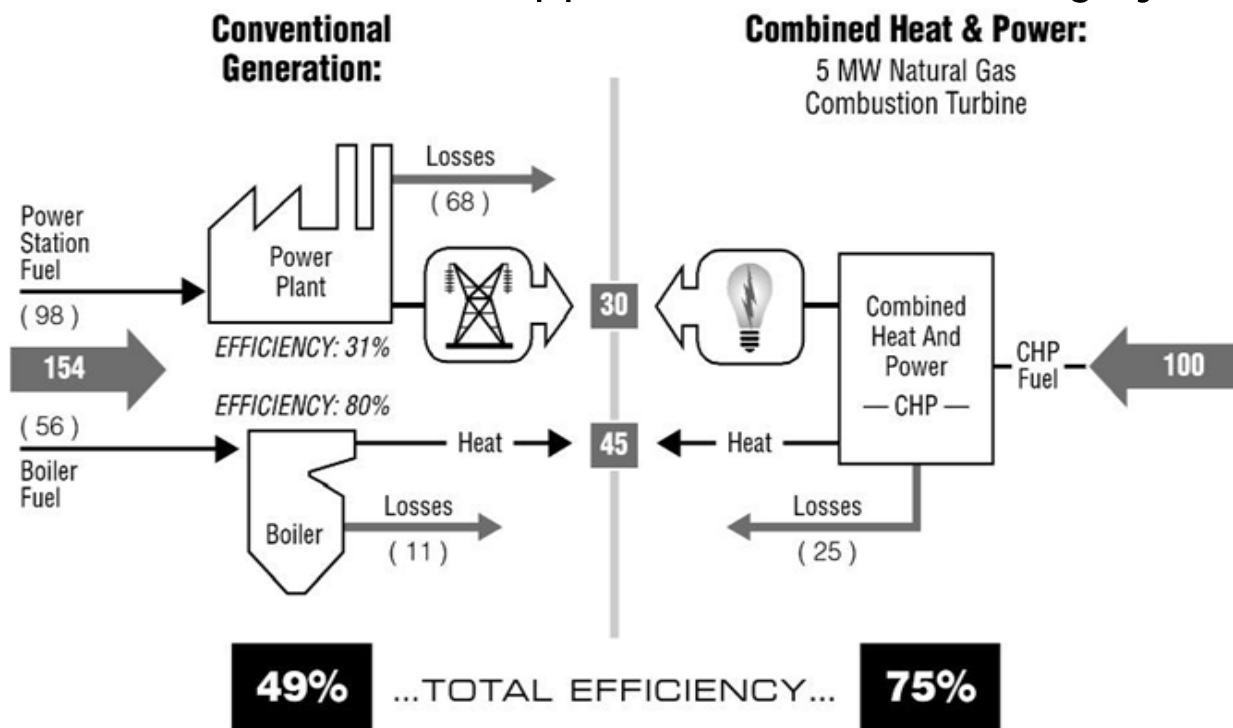
- Based on ASHRAE TC 9.9, it is possible for IDCs to utilize year-round cooling.
- Free cooling is not entirely free, since even air-side economization requires energy to move air, rotate a heat wheel, and so on.
- Annual average PUE can be reduced 20%-30%



POTENTIAL ENERGY EFFICIENT TECHNOLOGIES IN IDC

District energy system

- Use cogeneration system to provide electricity, cooling to IDCs.
- The primary energy efficiency should be raise up to 70%, comparing to conventional system of 40%
- Reuse the heat from IDC to support the district heating system.



Thank you very much

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