ENVIROTECH

&

CLOUD&HEAT

Heating buildings with data centres

OSLO 2016

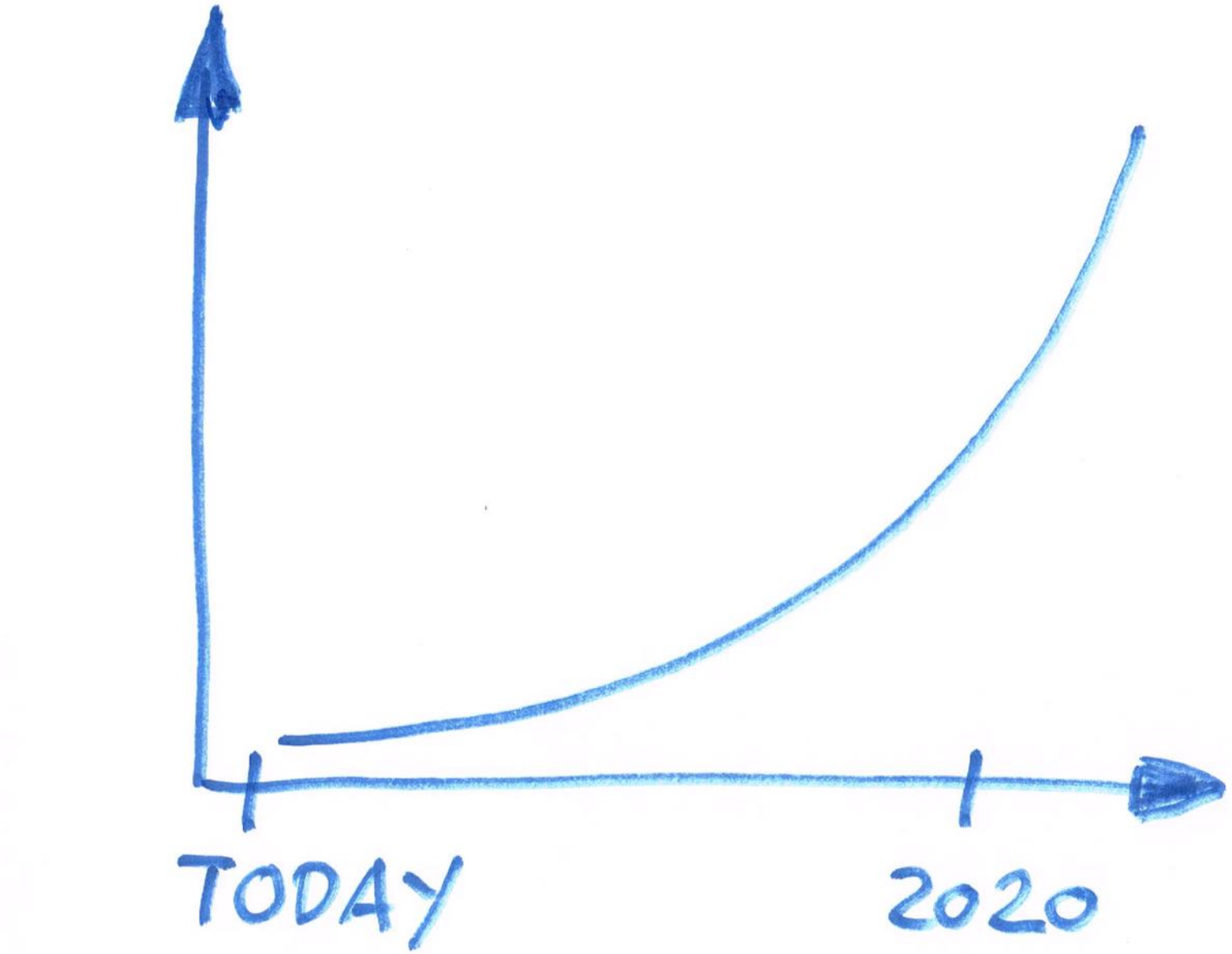
Dr. Jens Struckmeier
CTO/FOUNDER

Greenest Computing worldwide!

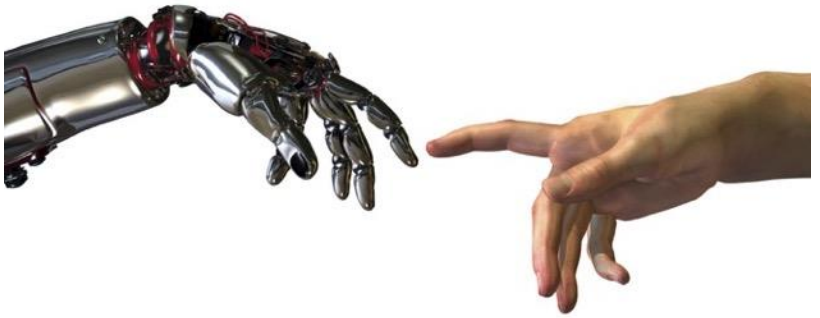
PUE 1.014

C&H Hot water cooled Servers and Datacenters

The Internet in 5 Years




industry
4.0




5G


Google

Today: 3 % of global electricity for Data

in 10 years: 15%

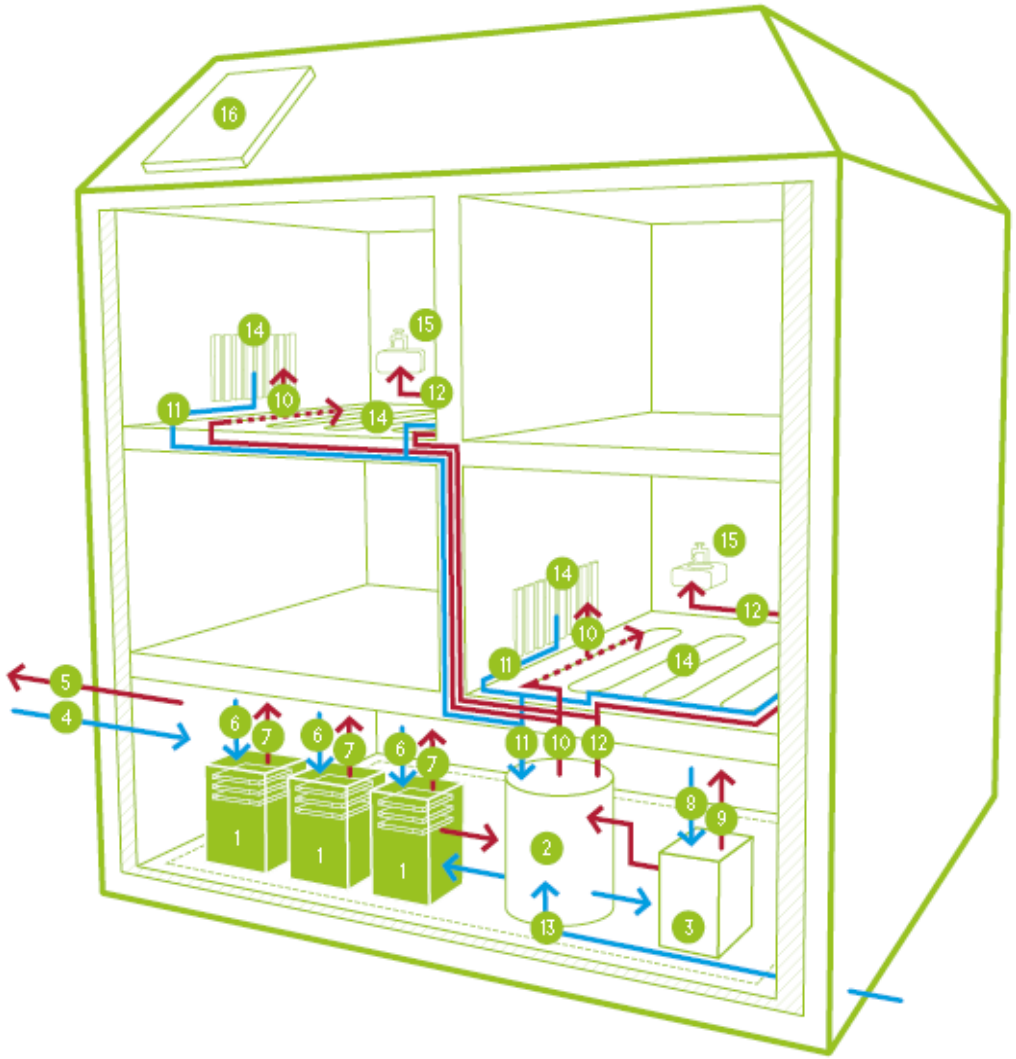
Classical Datacenter

Cooling Towers at Google's Data Center in The Dalles, Oregon, by Connie Zhou

#6 of 18 Cloud&Heat DataCenters

Dresden, Wallotstraße
Online since September
2014

C&H in Buildings



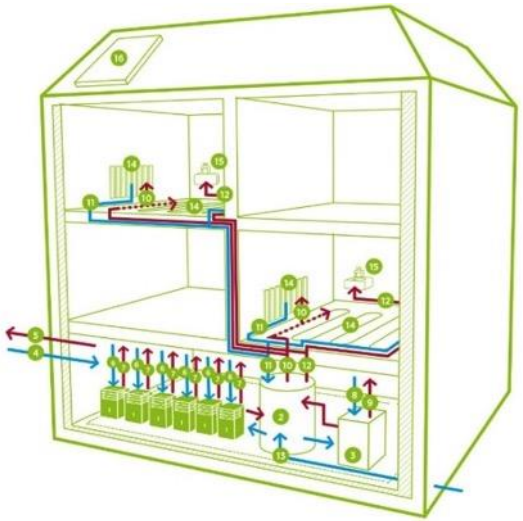
** entsprechend den Richtlinien „DVGW-Arbeitsblatt W 551"

1. Cloud&Heat Server
2. Pufferspeicher für Heizung + Warmwasseraufbereitung
3. Luft/Wasser Wärmepumpe
4. Zuluftsystem*
5. Abluftsystem*
6. Zuluft Cloud&Heat Server
7. Abluft Cloud&Heat Server
8. Zuluft Wärmepumpe
9. Abluft Wärmepumpe
10. Vorlauf Heizung
11. Rücklauf Heizung
12. Warmwasser**
13. Zulauf Frischwasser
14. Heizungssystem
15. Zapfstellen Warmwasser
16. Photovoltaik (optional)

*Anmerkung: auch als kontrollierte Wohnraumlüftung mit Wärmegewinnung oder z. B. Tiefgaragenentlüftung ausführbar

Cloud&Heat combines the fast-growing cloud-computing and data storage sector with the conventional heating and energy market by saving CO2.

- We use water to cool our servers. This is far more efficient than conventional air conditioning.
  This saves cooling energy.
- We use the server's heat to heat buildings.
  This saves heating energy.
- We use the customer's buildings which already exist.
  This saves facility costs.



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C&H DATACENTER in a BOX Savings

Cooling

90% less cooling costs

Heating

up to 97% less heating costs

In total
23.415 kWh per Rack per year
2.819 € and **8 tons CO_2**

per MW Datacenter
10.040.000 kWh
1.250.000 € and **18.000 tons CO_2**

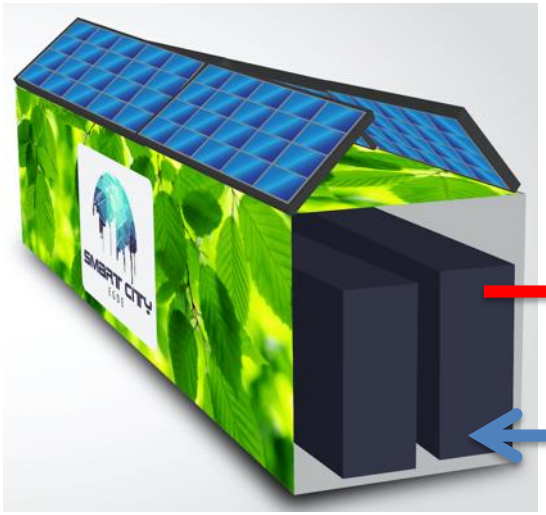
6.160.000 kW/h **2.240 t CO_2** **1.300.000 € energy costs**

Green Power in -> Green Heat out

Waste Heat into Revenue

1.05 MW

1 MW



55°C-60°C

40°C-50°C

Direct hot water liquid cooling

0.9 MW

Low Temp Heating Systems

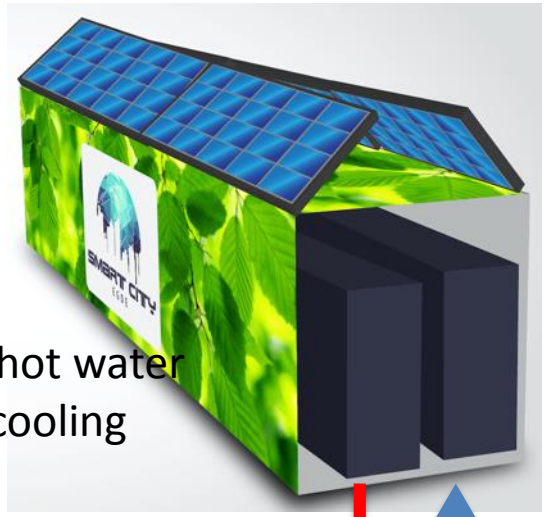
90% Waste Energy Reusage WITHOUT HEATPUMP
(most cost & energy efficient)

Green Power in -> Green Heat out

Waste Heat into Revenue

1.2 MW

1 MW



Direct hot water liquid cooling

0.2 MW

60°C

40°C-50°C

HEAT PUMP

60°C-85°C

30°C-55°C

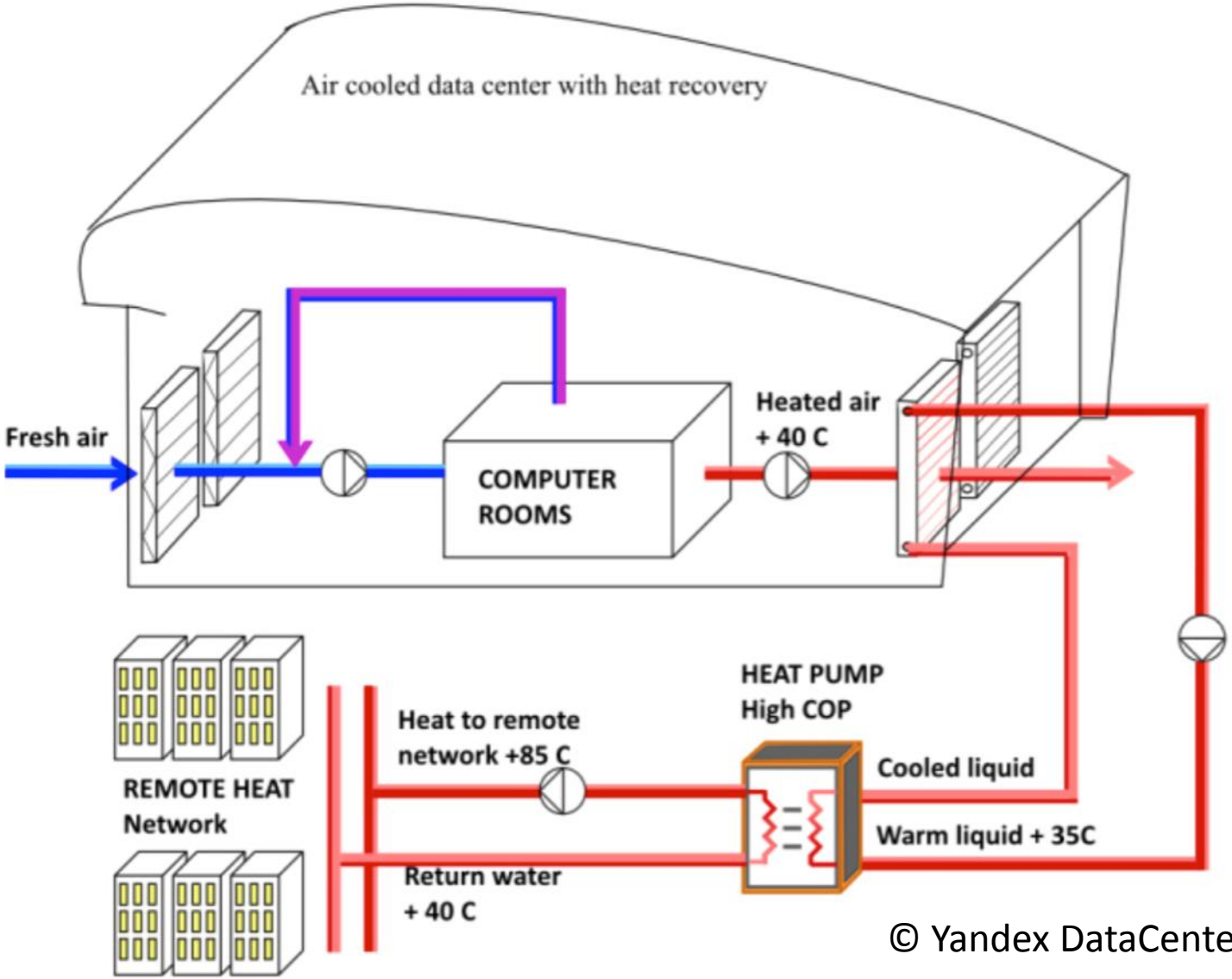
1.2 MW

100% Waste Energy Reusage WITH HEATPUMP
(more common solution)

Good Practice Example Mäntsälä, Finland

Good Practice Example Mäntsälä, Finland

Air Cooled Datacenter

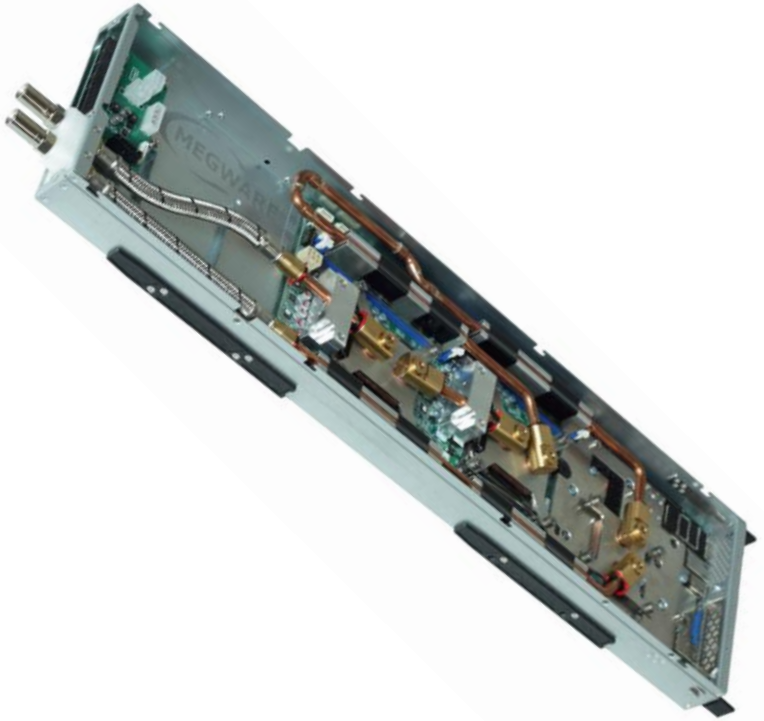


© Yandex DataCenter Mäntsälä 2015

Best Practice for air cooled DC → new generation **water cooled**

1 MW Cloud&Heat datacenter

50% more efficient than Yandex DC



DEUTSCHER RECHENZENTRUMSPREIS 2016

1. PLATZ KATEGORIE B: GESAMTHEITLICHE ENERGIEEFFIZIENZ IM RECHENZENTRUM

n-tv

CHIP

t3n we love technology

Frankfurter Allgemeine ZEITUNG FÜR DEUTSCHLAND

Slate

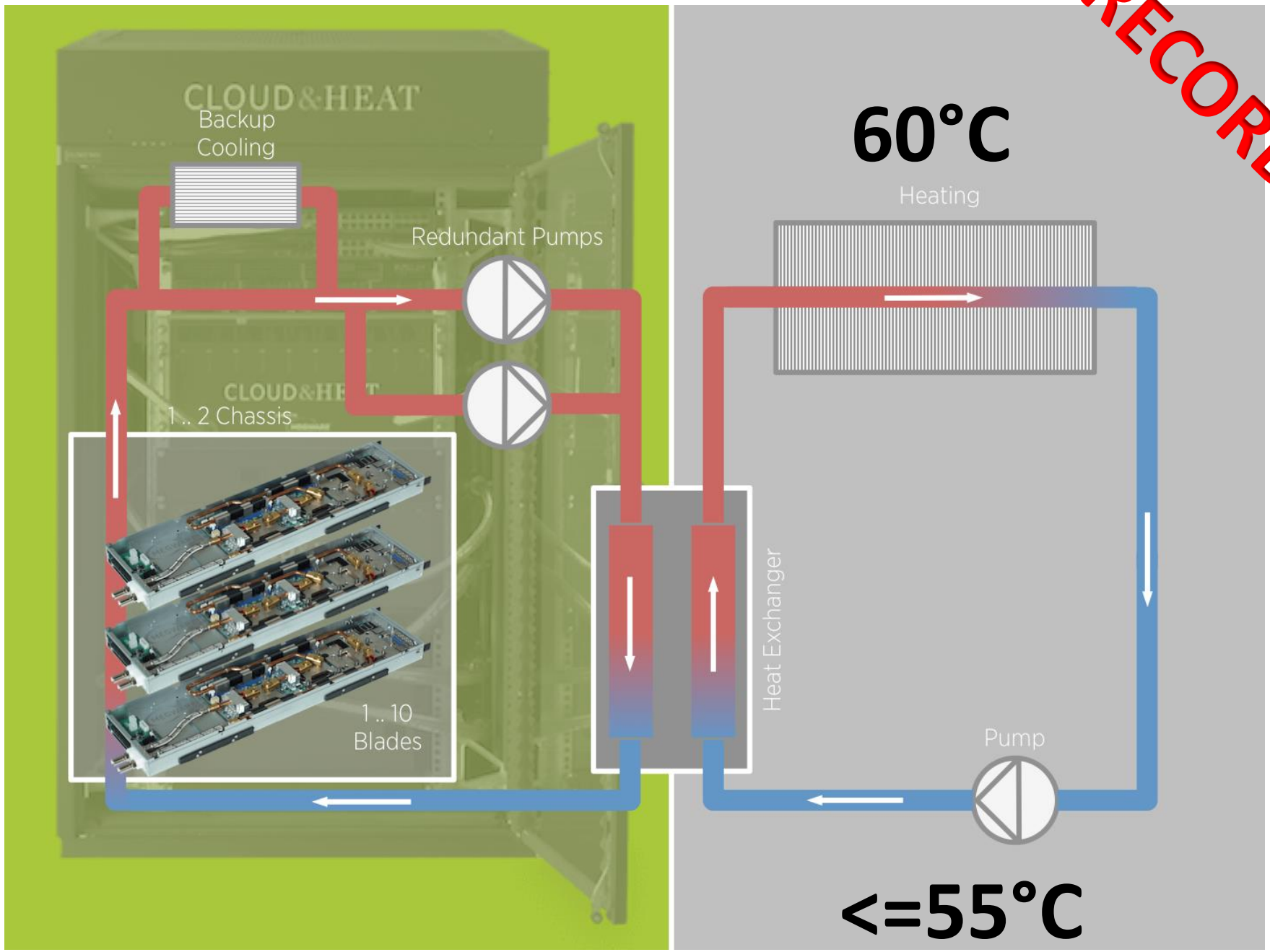
DIE WELT

DER SPIEGEL

EM Magazine

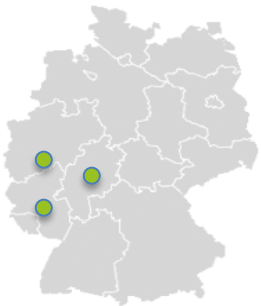
1 MW Cloud&Heat datacenter

50% more efficient than Yandex DC



Proof of Concept and district heating projects

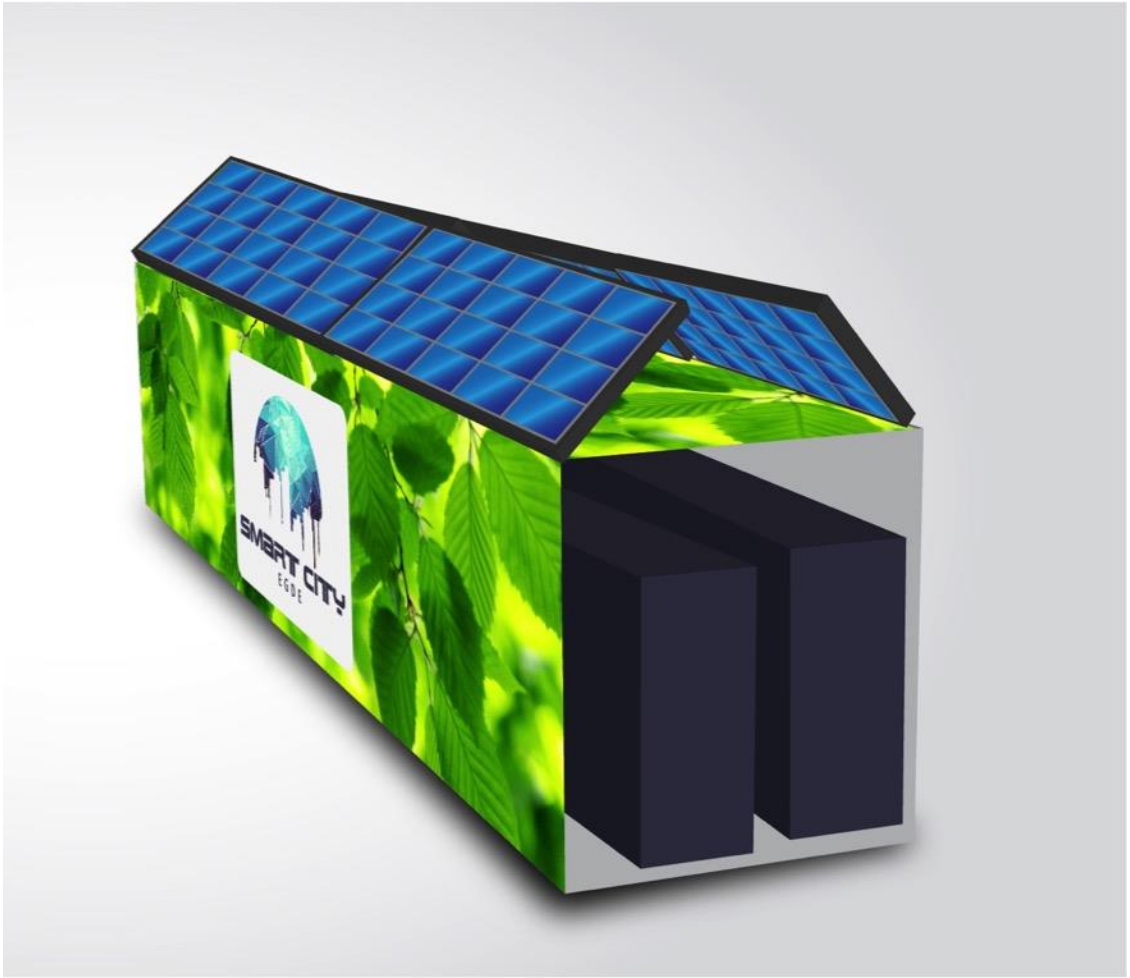
- Since 2011, more than 15 locations went live, with more than 100 high-tech, water-cooled server cabinets in operation.
- We have an excess demand for the heating system. More than 1000 requests in 2015 from potential customers
- We offer new products/solutions for the energy market (heating systems, energy saving, prospective distributed energy storage)
- We provide the future distributed IT infrastructure for different applications and future services (5G, Edge Cloud, BigData, Smart City, Smart Building, Smart Home, Smart Grid etc.)

Dresden – Germany Partner: Local utility company	Simmern - Germany Partner: RWE - innogy	Dresden – Germany (in planing) Partner: Utility company
Local small datacenter – 90% hot water supply and up to 30% of heating for 56 flats combined with district heating	Decentralized datacenter infrastructure (3 locations) incl. heating of those buildings.	MW water-cooled and most energy efficient datacenter incl. connection to district heating systems
	 	

First and actual project in Norway

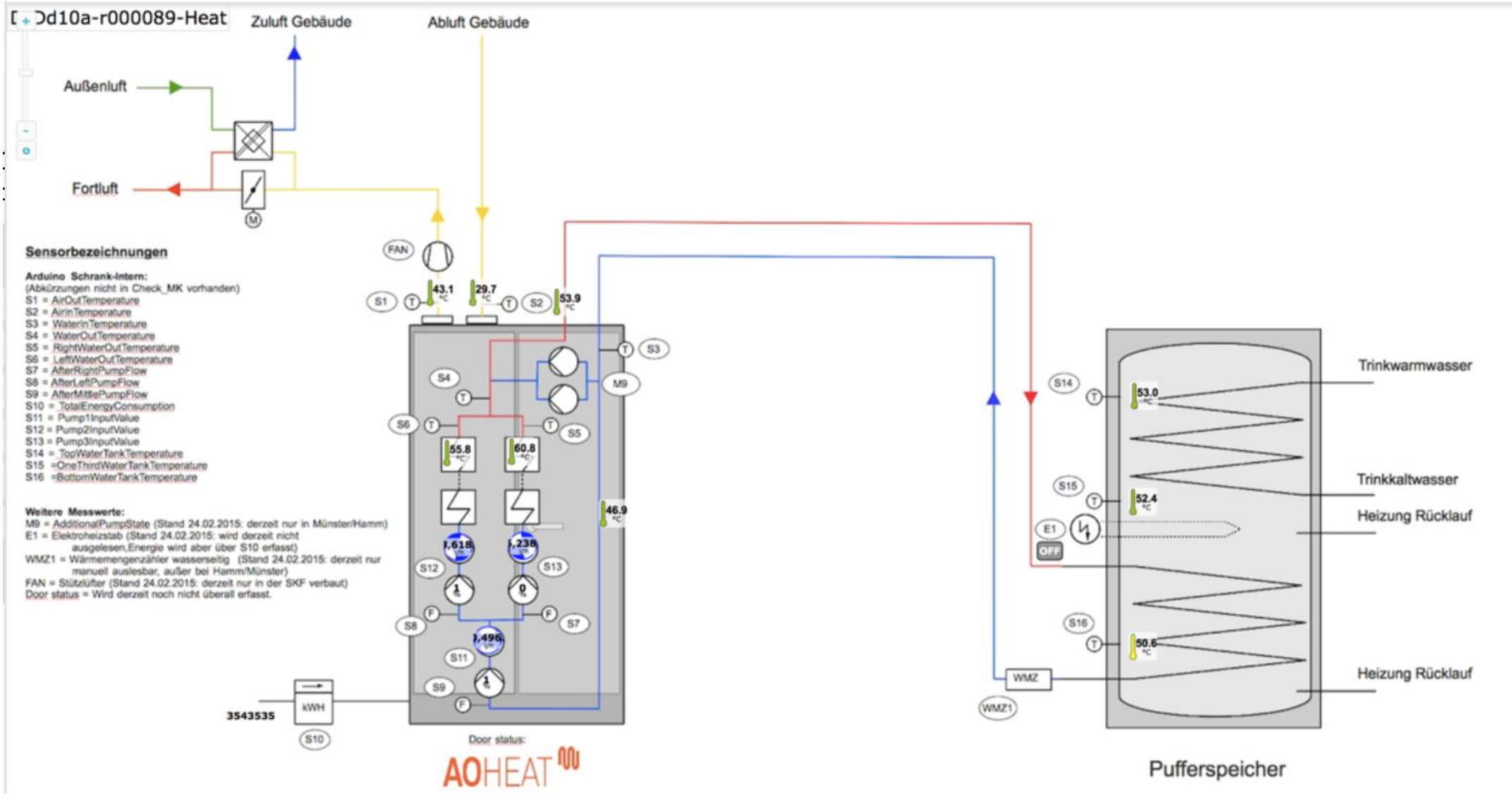
Datacenter in a container

- **Scalable**, transportable, **water cooled data center** solution in a container format.
- The installed water-cooling concept is based on **patented** technology of Cloud&Heat.
- Heat **connection to any heating system** type possible.
- The container size is based on a common **20 feet** equivalent unit
- up to **120kW heat fully** (with typical server load 40kW) per container



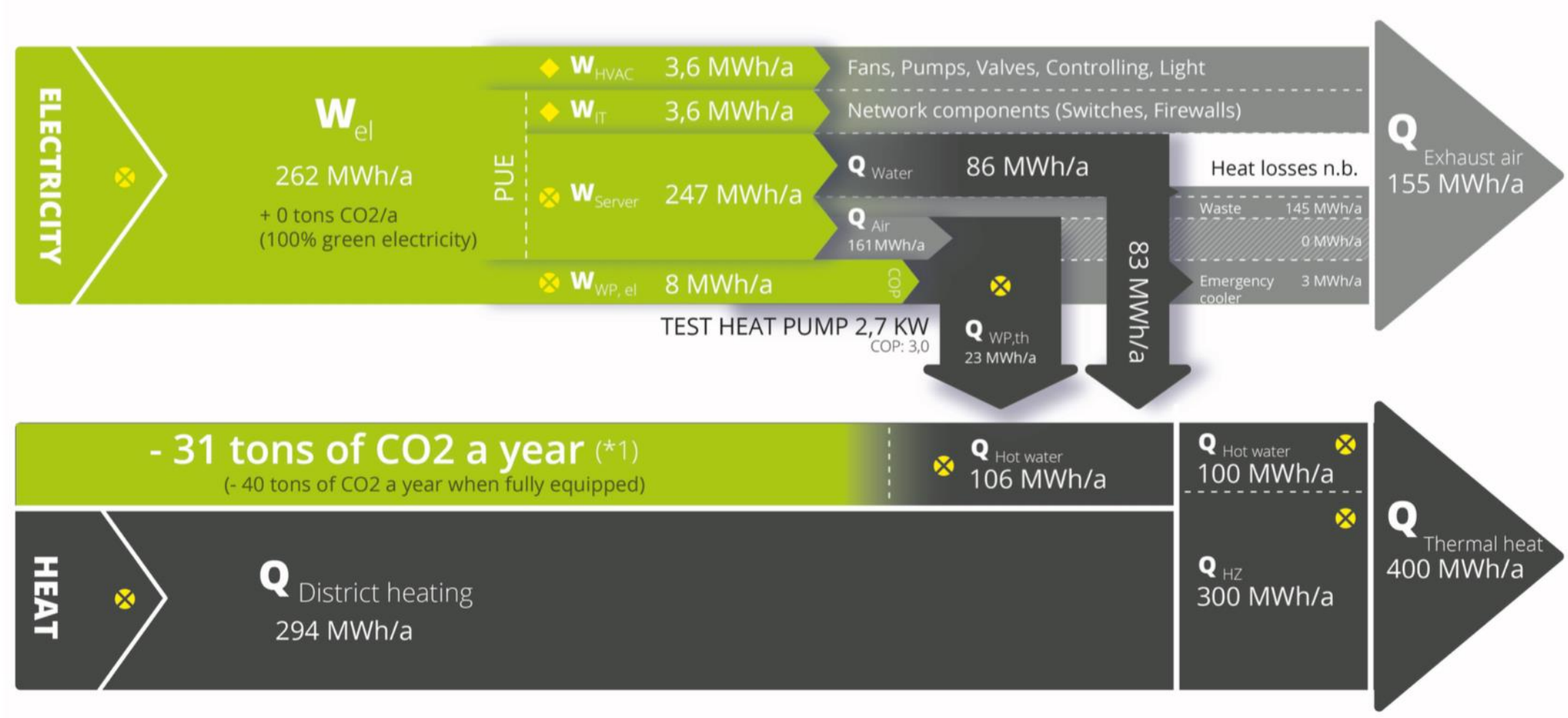
Easy operation & monitoring

Licence free fully automated operation, monitoring and alarming (NagVis/CheckMK)



Energy flow Chart & real time PUE measurement

Wallotstrasse PUE 1.014, ERE 0.68 (World Record)



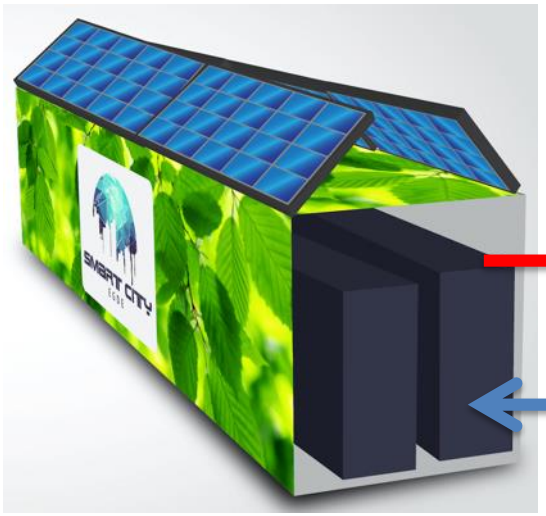
Water Cooled Servers Savings

1 MW datacenter saves / earns yearly up to

10.040.000 kWh

18.000 t CO_2

1.250.000 € energy costs



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Now we are looking for further projects in Norway

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