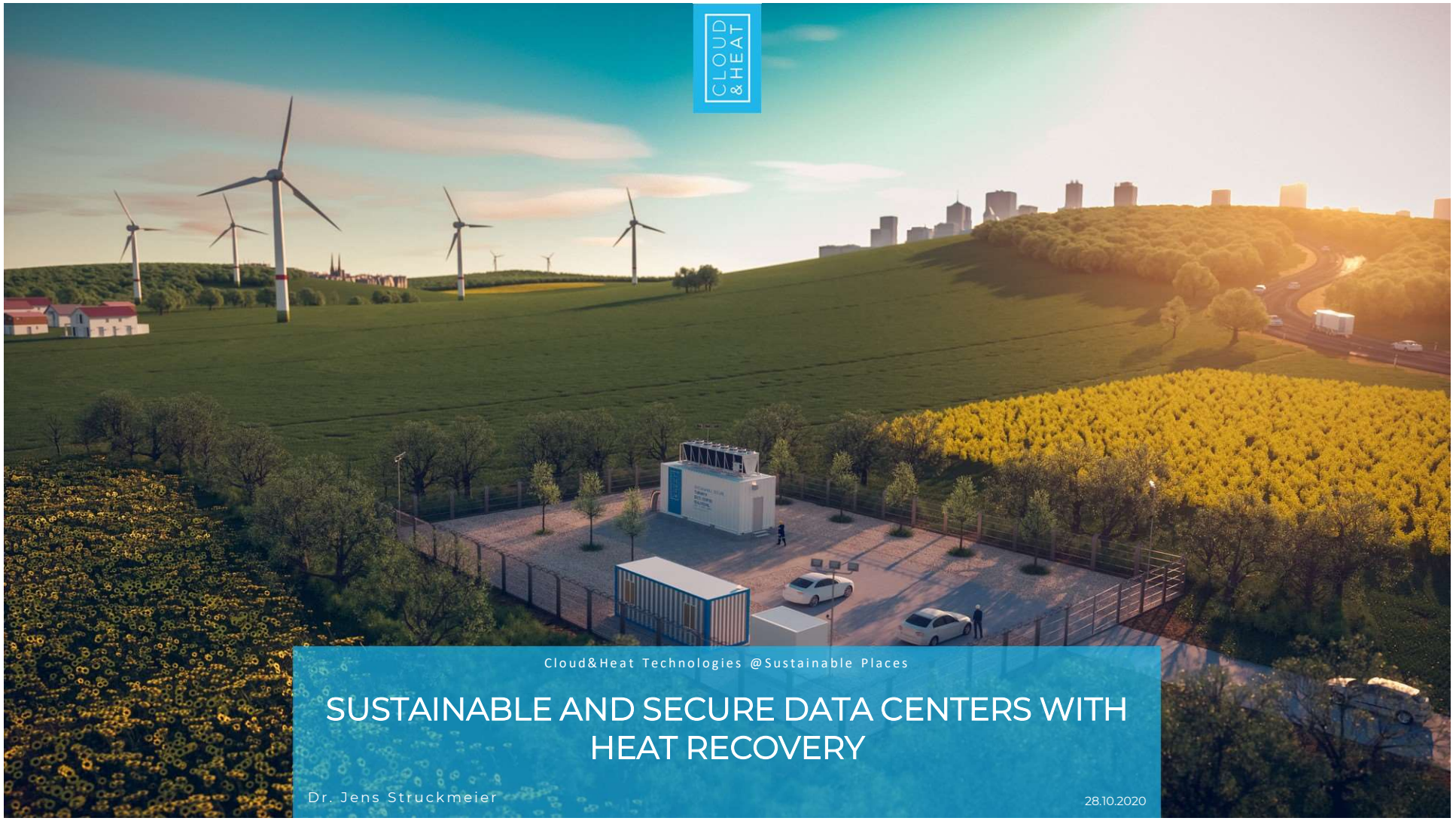
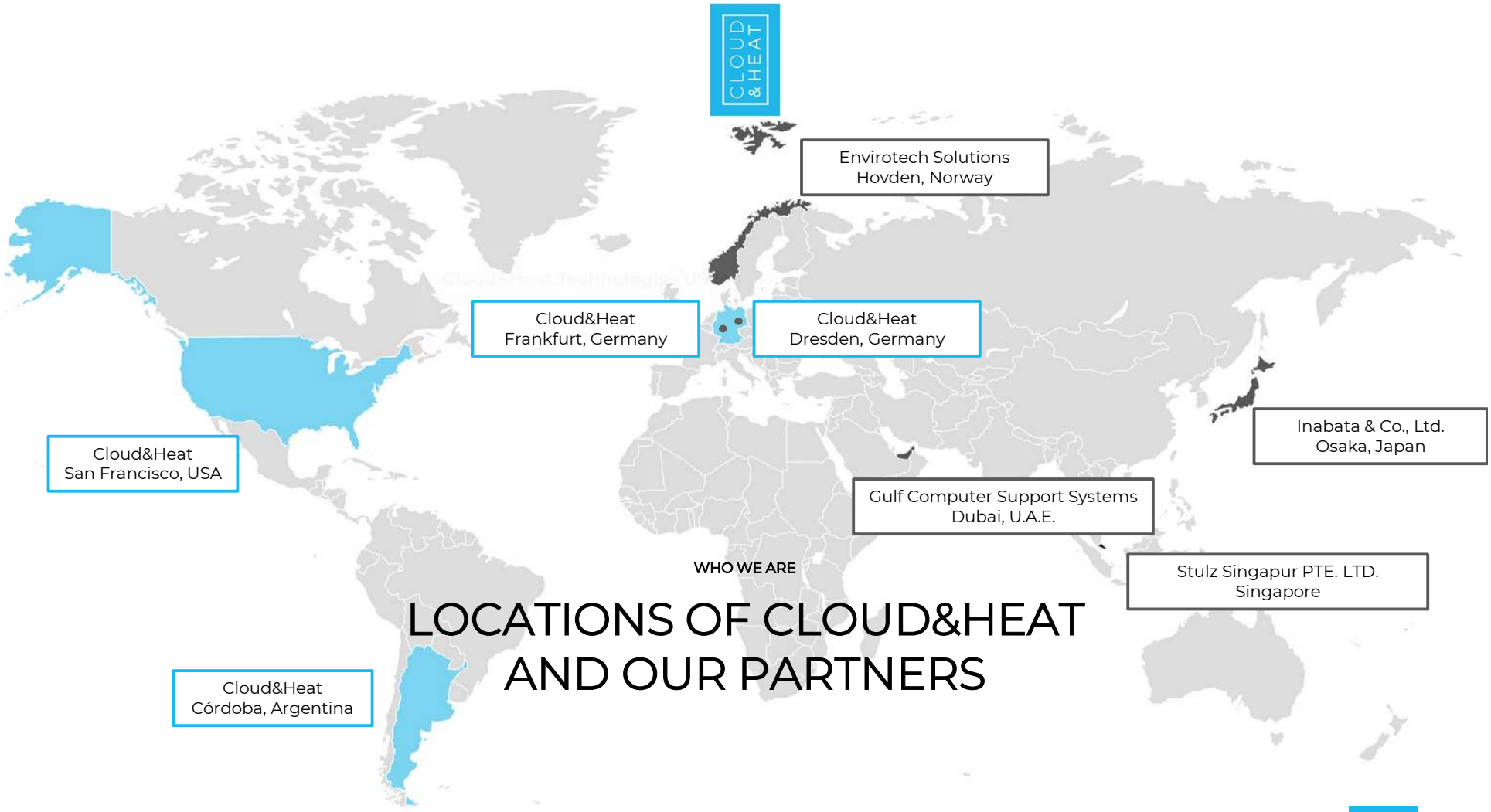


Cloud&Heat Technologies @Sustainable Places

SUSTAINABLE AND SECURE DATA CENTERS WITH HEAT RECOVERY

Dr. Jens Struckmeier

28.10.2020

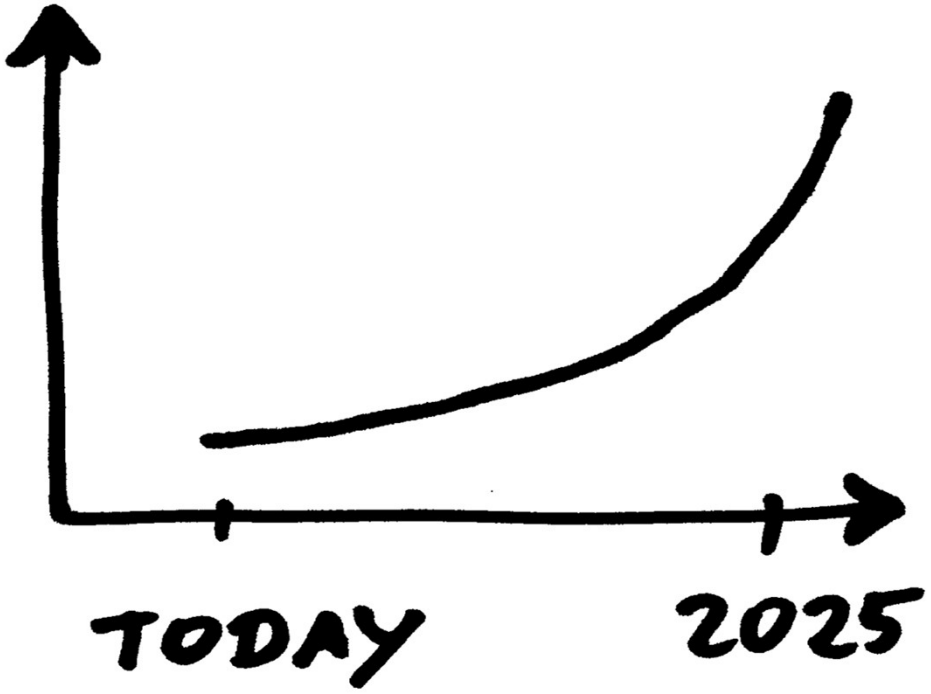


WHO WE ARE

LOCATIONS OF CLOUD&HEAT AND OUR PARTNERS

3 BIG CHALLENGES

1 GROWTH



TODAY'S CHALLENGES AND OPPORTUNITIES

USAGE OF DEEP LEARNING

3 BIG CHALLENGES

2 SECURITY

EUROPÄISCHE CLOUD SERVICE DATENSCHUTZZERTIFIZIERUNG

DATA PROTECTION

Gefördert durch:

Bundesministerium
für Wirtschaft
und Energie

aufgrund eines Beschlusses
des Deutschen Bundestages

DSGVO

Goal: innovative development of certification for data security of cloud services

auditor

Follow-up project of Trusted Cloud Data Protection Profile (TCDP)

MEMBER

Cloud&Heat is member of the consortium and will be the first provider of IaaS, that passes the certification process

ISO 27001

Certified data security by ISO 27001

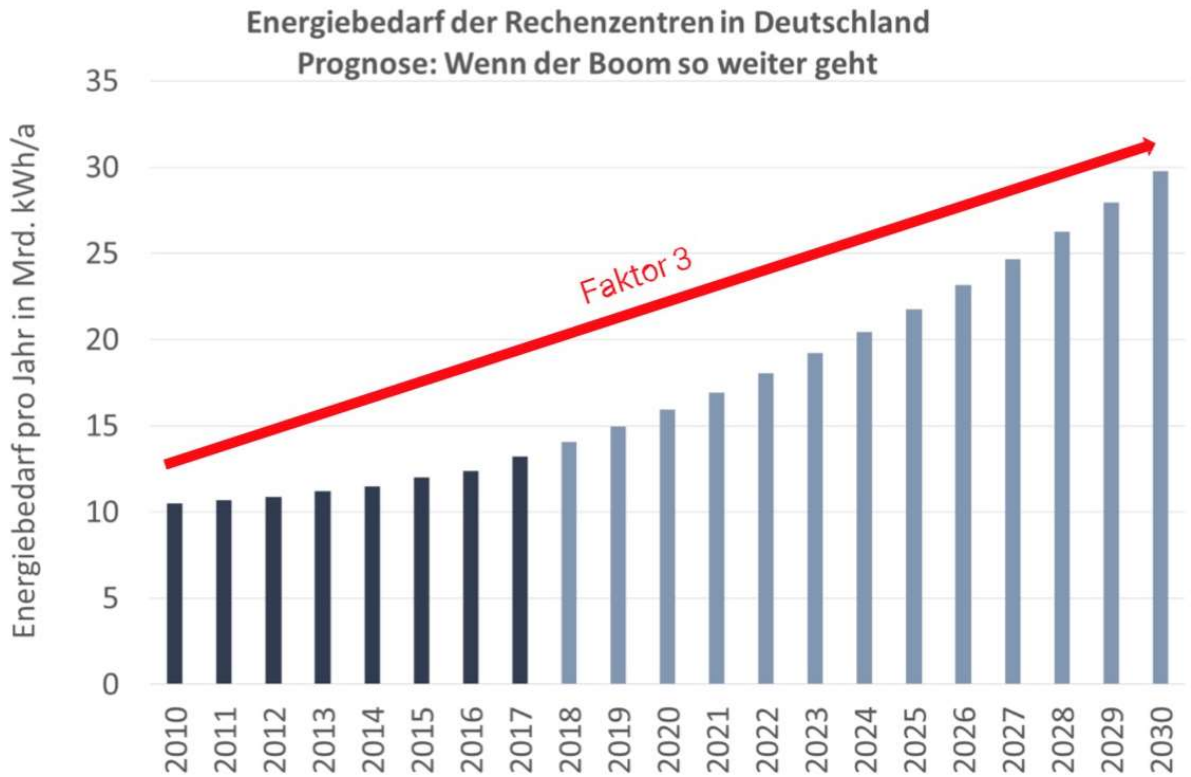
3 BIG CHALLENGES

3

SUSTAINABILITY

ENERGY DEMAND OF DATA CENTERS

FORECAST FÜR GERMAN DATA CENTERS



Source: Borderstep, Hintemann, 2018

ENERGY DEMAND OF DATA CENTERS

ENERGY NEEDED FOR AN AI TRAINING

training a robot to solve the Rubik's Cube through trial and error: ▶ **2.8 GWh**

caused emissions: ▶ **1282 t CO_2**

equals to more than: ▶ **1500 round trips from Berlin to Chicago**

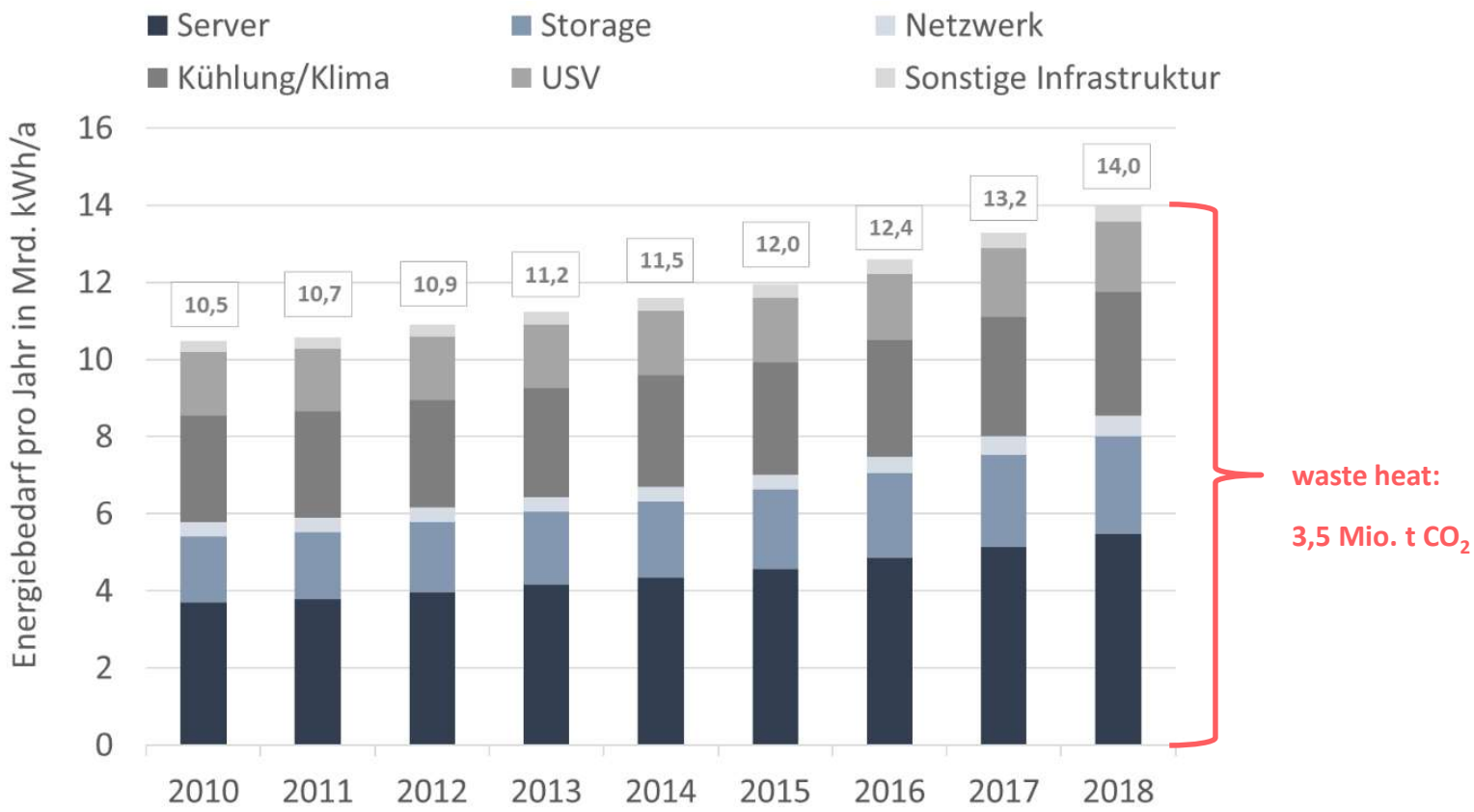
https://www.wired.com/story/ai-great-things-burn-planet/

https://www.eia.gov/electricity/state/unitedstates/index.php

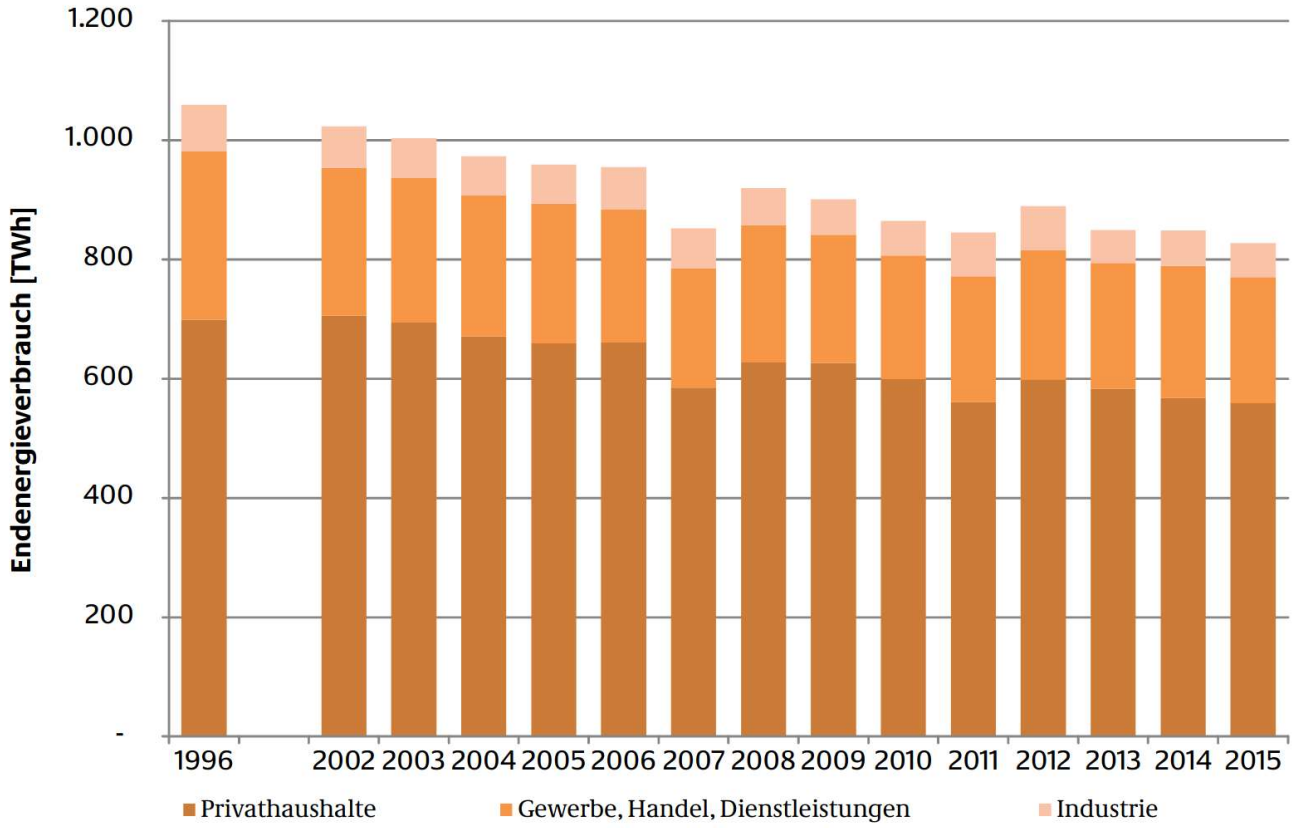
https://www.icao.int/environmental-protection/Carbonoffset/Pages/default.aspx

ENERGY DEMAND OF DATA CENTERS

COMPOSITION OF ENERGY DEMAND IN GERMAN DATA CENTERS



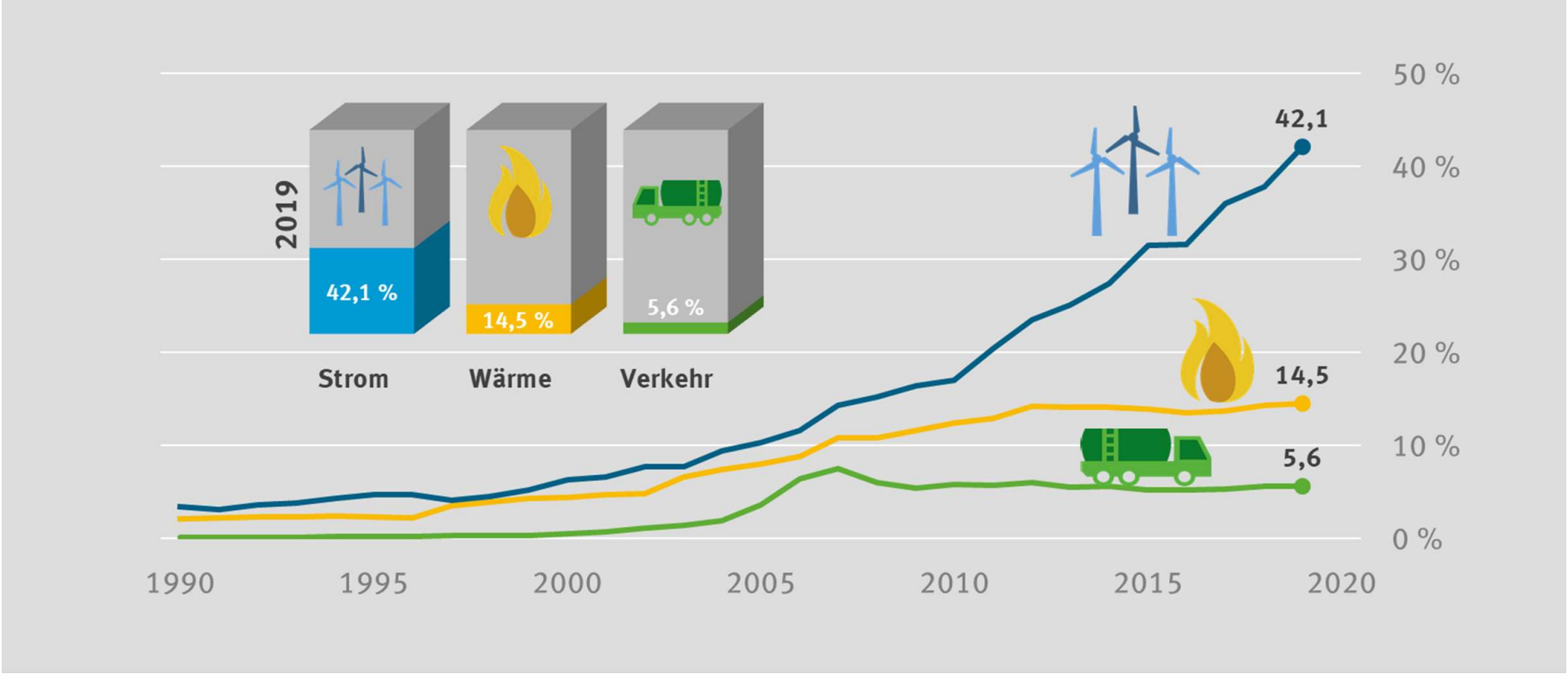
DEMAND OF HEATING ENERGY AND WARM WATER IN GERMANY



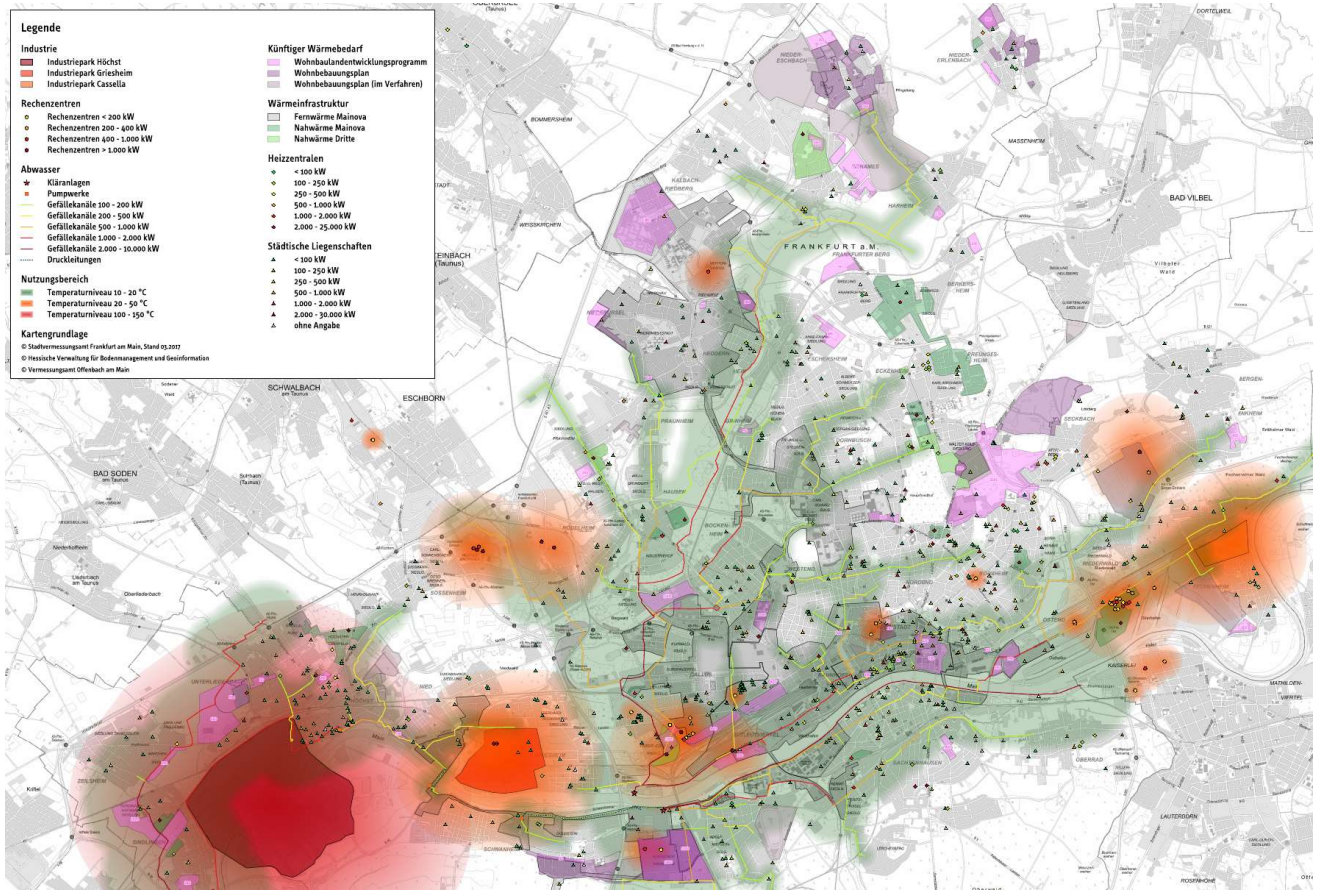
Source: dena Gebäudereport 2016

RENEWABLES ENERGIES IN GERMANY

RATIO OF RENEWABLES IN SECTORS



HEAT REUSAGE POTENTIAL IN FRANKFURT/MAIN



Source:
Energiemanagement,
Stadt Frankfurt

EEG-Novelle zu optimistisch

Wirtschaftsministerium unterschätzt Strombedarf

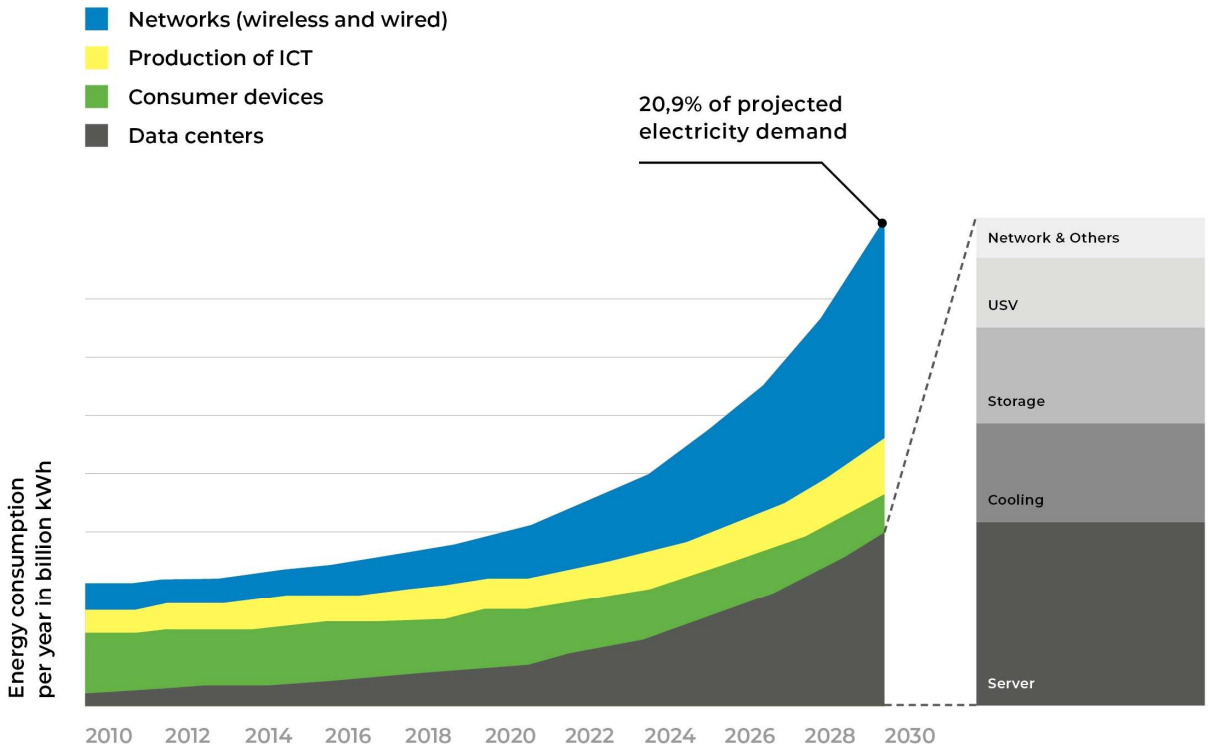
Wie stark Wind- und Solarenergie ausgebaut werden müssen, hängt vom künftigen Stromverbrauch ab. Der wird in der EEG-Novelle unterschätzt, sagen Forscher - das Erneuerbare-Energien-Ziel für 2030 reiche bei Weitem nicht.

Von **Ralph Diermann**
25.09.2020, 10.13 Uhr


Foto: Frank Rumpenhorst/dpa
Europaparlament verschärft Klimaziel: CO2-Ausstoß soll bis bis 2030 um 60 Prozent sinken
Bisher hat die EU eine Reduzierung des Ausstoßes um 40 Prozent geplant.

WHY CLOUD&HEAT?

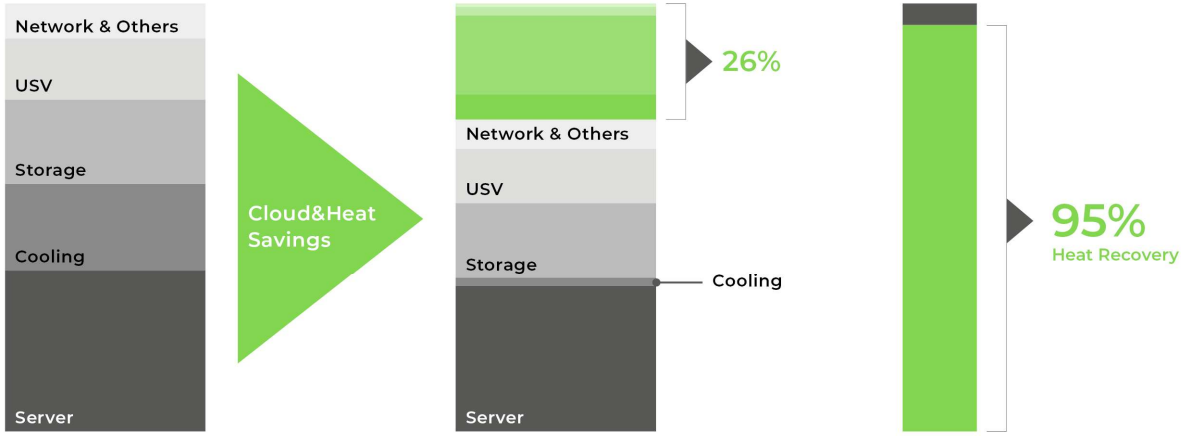
RISING DEMAND OF ENERGY FOR DATA CENTERS



*Source: Nature 561; 163-166 (2018)

WHY CLOUD&HEAT?

SAVINGS WITH CLOUD&HEAT



Data Center
Energy Consumption

Data Center
Energy Consumption with
Cloud&Heat Technology

Waste Heat Recovery

*Source: Borderstep (Hintemann; 2018)

OUR TECHNOLOGY

PRIMARY ENERGY FACTOR = 0,0

- ratio of utilised primary energy to used final energy
- includes supply reliability and climate impact (e.g. CO2 emissions)
- relevant for EnEV and EEWärmeG
- 0,0 because of industrial heat reusage

TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Maschinenwesen Institut für Energietechnik
Professur für Gebäudeenergietechnik und Wärmeversorgung

Zertifikat

Hiermit wird bescheinigt,
dass auf Grundlage der vorliegenden Betriebsdaten das

„Serverbasierte Heizsystem Heat zur dezentralen Wärmeversorgung"
der CLOUD & HEAT Technologies GmbH Dresden

durch das

Institut für Energietechnik der TU Dresden,
Professur für Gebäudeenergietechnik und Wärmeversorgung

geprüft und in Anlehnung an das AGFW-Arbeitsblatt FW 309 Teil 1
als externe Wärmelieferung aus industrieller Abwärme
folgendermaßen bewertet wurde:

Primärenergiefaktor der externen Wärmelieferung $f_{P,ext}$:	0,00
Die Wärmebereitstellung erfolgt mit einem Anteil von aus industrieller Abwärme.	100,0 %

Technische Universität Dresden
Fakultät Maschinenwesen
Institut für Energietechnik
Professur für Gebäudeenergietechnik und Wärmeversorgung
Prof. Dr.-Ing. Clemens Felsmann
01062 Dresden

Prof. Dr.-Ing. C. Felsmann
Leiter der Professur

Stempel

Dr.-Ing. T. Sander
Bearbeiter
fe-Gutachter-Nr.: FW 609-010

Dresden, 09.05.2014

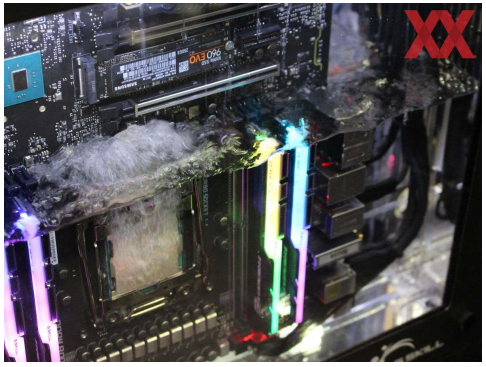
TYPES OF COOLING

FROM AIR TO DIRECT HOT WATER COOLING

Air Cooling

Hybrid Cooling

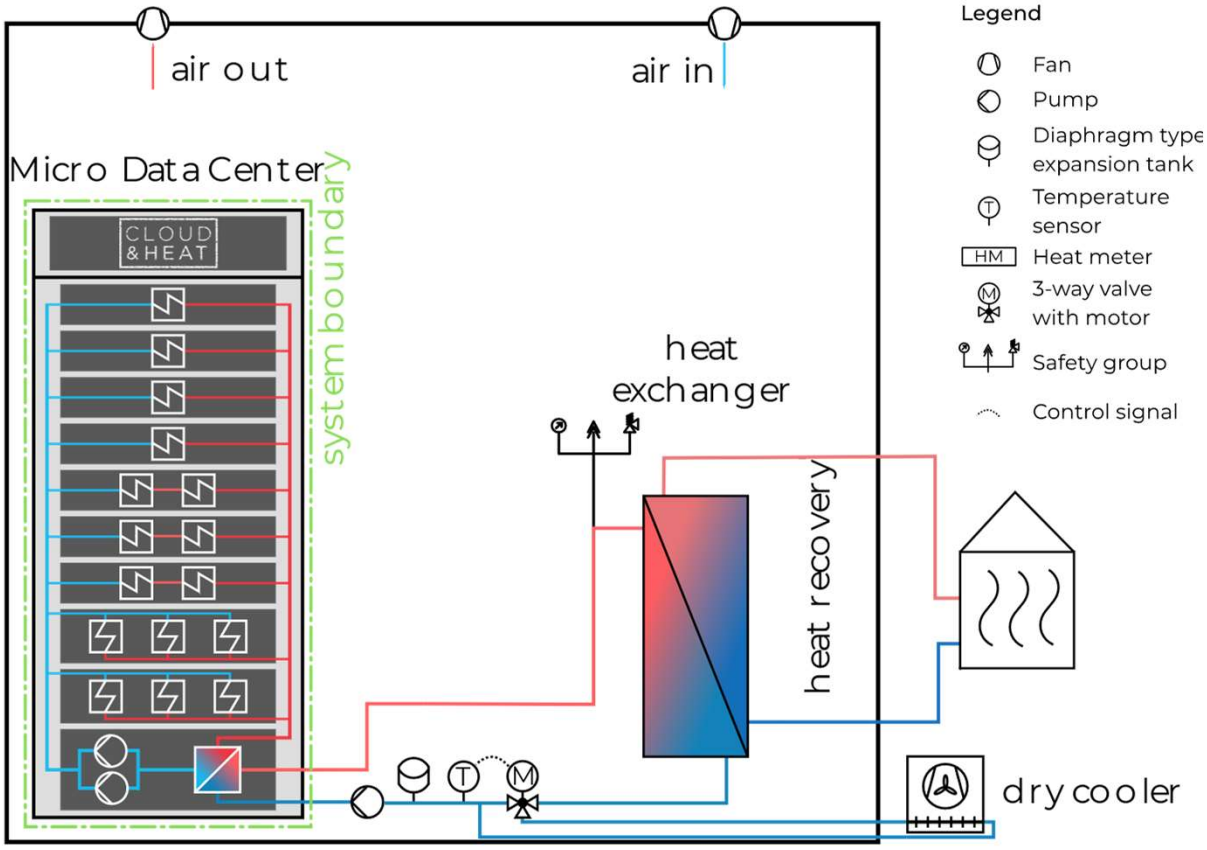
Immersion Cooling



Direct Water Cooling

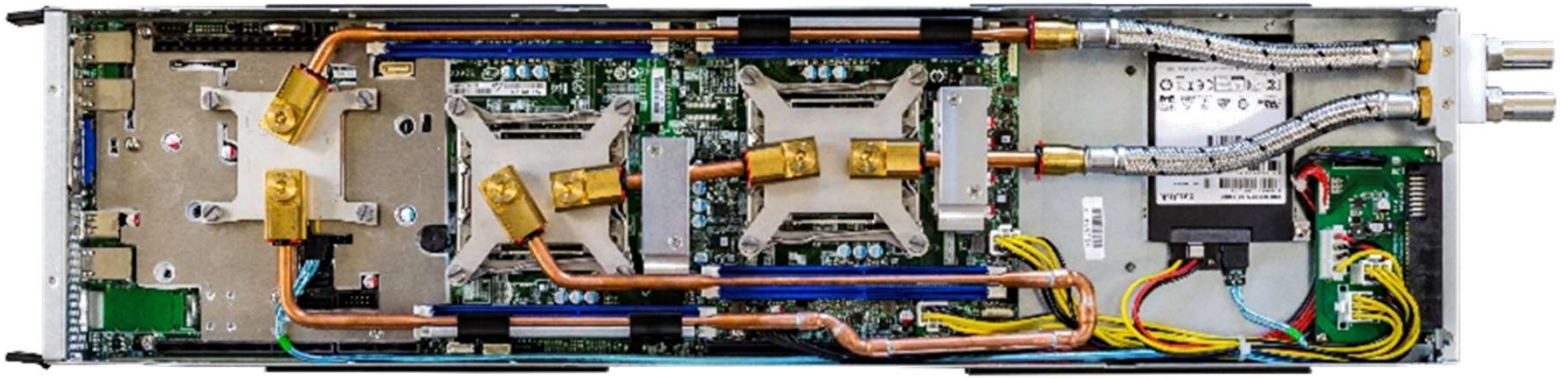
DIRECT HOT WATER COOLING

HYDRAULIC SCHEME



DIRECT HOT WATER COOLING

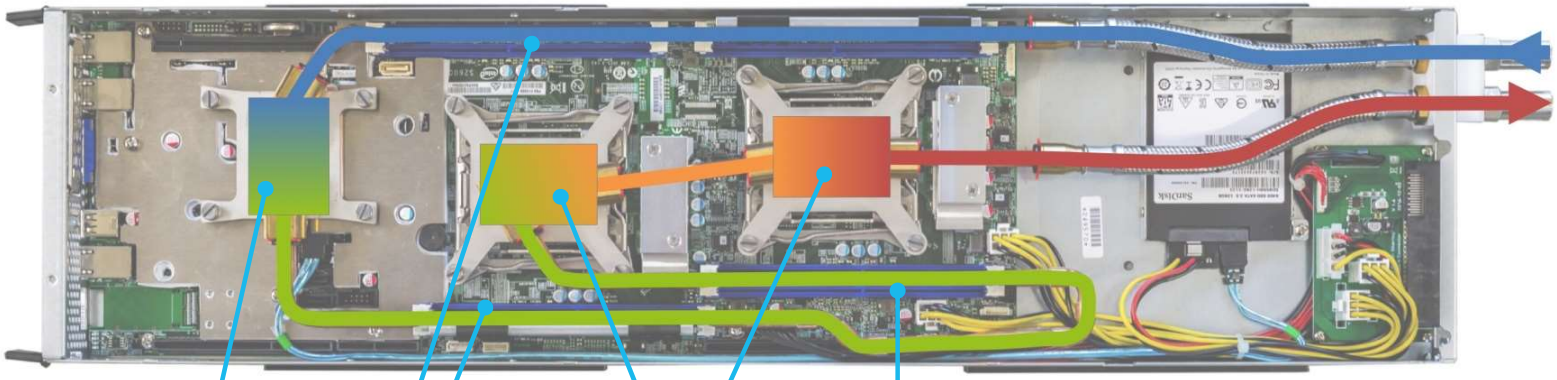
CAPTURING 90% OF THE EMITTED HEAT



Source: www.megware.com

DIRECT HOT WATER COOLING

CAPTURING 90% OF THE EMITTED HEAT



Source: www.megware.com

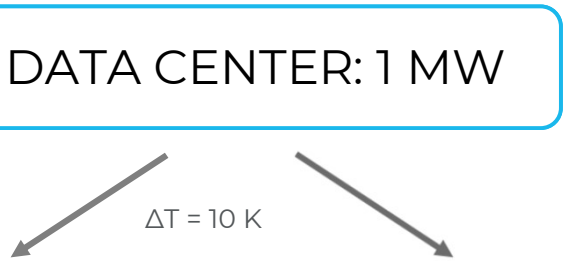
UP TO 55 °C
UP TO 60 °C

MAINBOARD RAM CPU RAM

WHY HOT WATER COOLING?

PHYSICAL ADVANTAGES

AIR	WATER 25 °C, 1 bar



Factor: 3500

WHY HOT WATER COOLING?

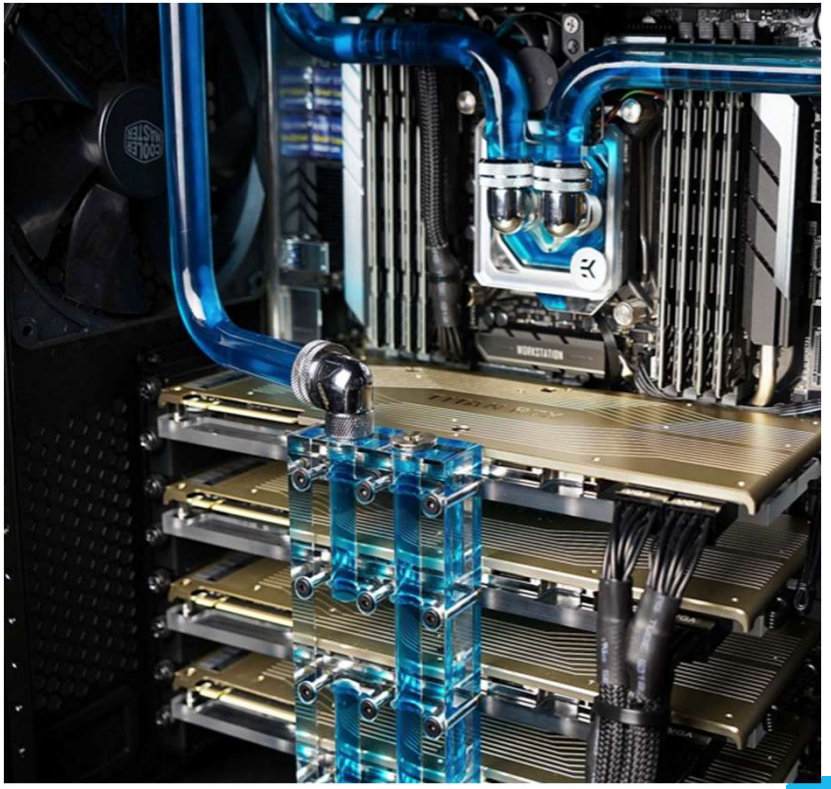
ADVANTAGES

1. Up to 4x higher energy density

2. No air conditioning needed

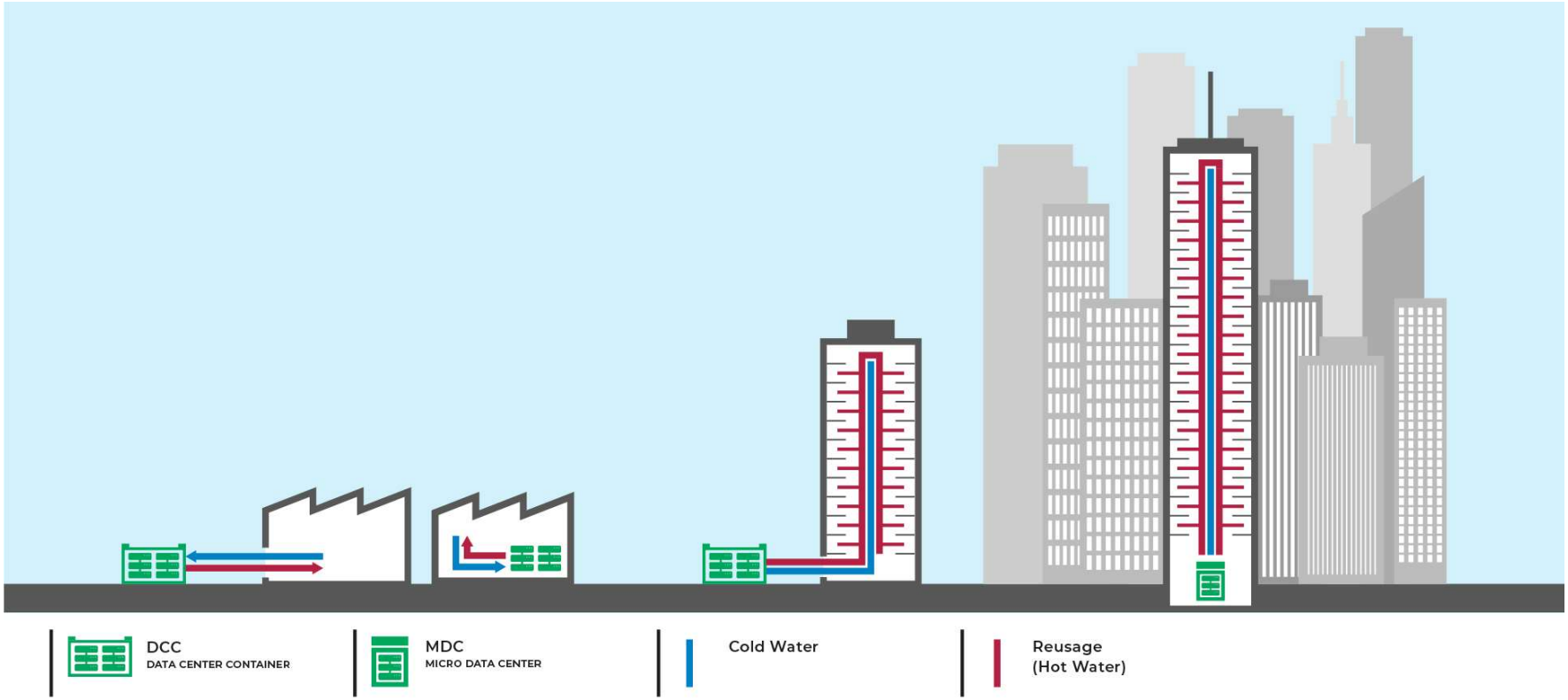
3. Direct heat recovery – „Building Heating“

4. Plus 10% extra energy savings by removing the fans



WATER-COOLED DATA CENTERS

WASTE HEAT UTILIZATION



USE CASE: WALLOTSTRASSE

APARTMENT BUILDING IN DRESDEN

USE CASE: WALLOTSTRASSE

TECHNICAL DATA:

- waste heat utilization of up to 110.000 kWh/a

Housing units in Dresden

56

Living area

6000 m²

Server racks Datasafe

20

IT power

60 kW

GOAL:

CUSTOMER:

DREWAG

branch: utility

products: energy, water, gas

year: 2014

USE CASE: WALLOTSTRASSE

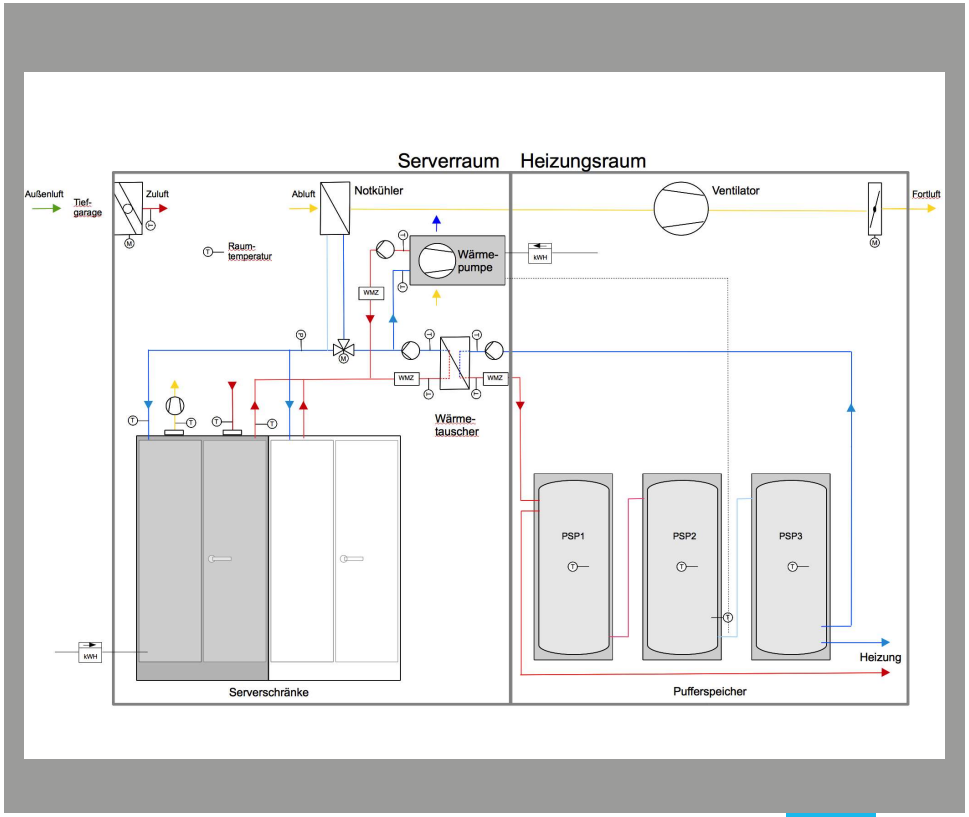
HYDRAULIC SCHEME

1:

- Apartments are provided with warm water and heating energy via the hot water cooling technology in Dresden

2:

- Heating of the complex using waste heat



CUSTOMER:

DREWAG

branch:	utility
products:	energy, water, gas
year:	2014

USE CASE: INNOGY SE

TECHNICAL DATA:

sites in Rhineland-Palatinate
3

Micro Data Center
3

Nodes
21

IT power
21 kW

GOAL:

- installation of an edge cloud in Rhineland-Palatinate on the basis of OpenStack

CUSTOMER:

innogy

VSE NET

branch: utility
products: electrical energy
year: 2017

USE CASE: EUROTHEUM FRANKFURT

TECHNICAL DATA:

Area up to
413 m²

IT power up to
400 kW

Saved cooling costs up to
189,000 €

Saved heating costs up to
65,000 €

GOAL:

- modernization of older data center and waste heat reusage for gastronomy and hotel

CUSTOMER:

COMMERZ REAL

branch: financials
products: asset management
year: 2017

Link: virtual tour

USE CASE: EUROTHEUM

ENERGY-EFFICIENT DATA CENTER IN FRANKFURT

PUE old = 1,92

- completely air-cooled
- use of chillers

PUE new = 1,27

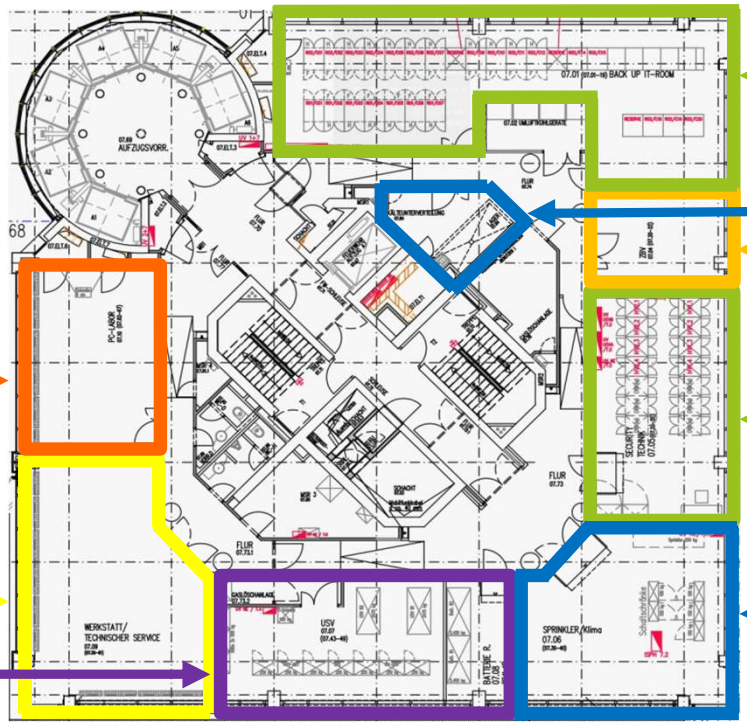
- direct water cooling
- heat reusage for hotel and gastronomy
- free cooling

USE CASE: EUROTHEUM

FLOOR PLAN

7th floor

area: 415 m²



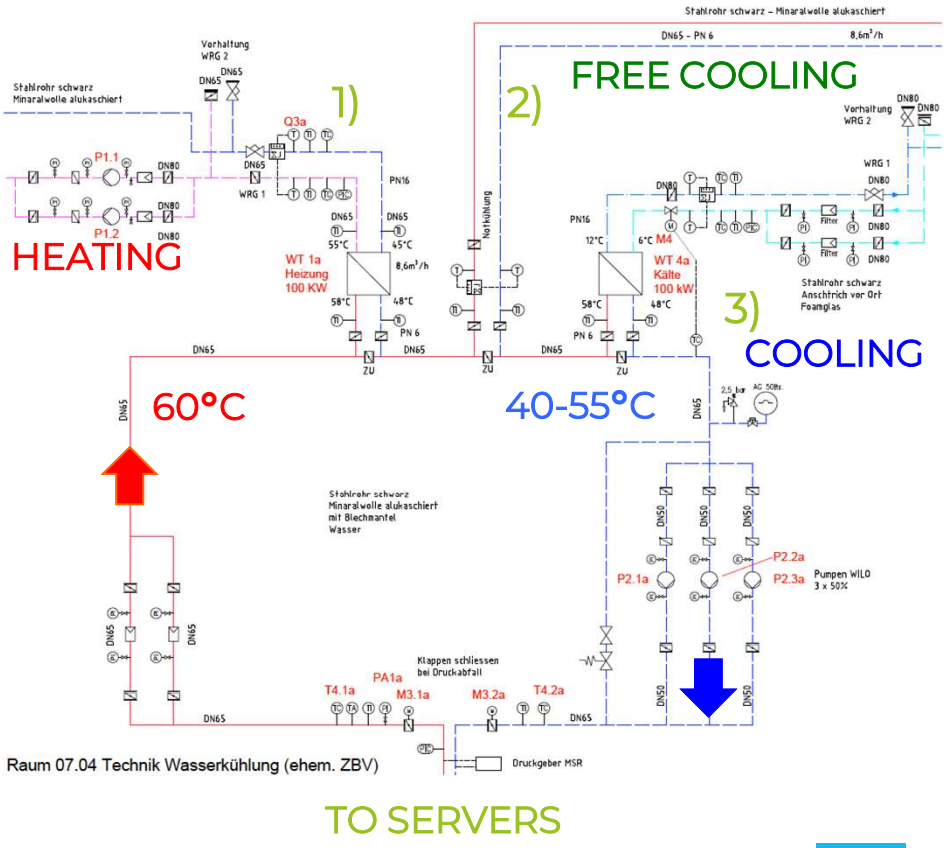
USE CASE: EUROTHEUM

HYDRAULIC SCHEME

- → additional coolers by exceedance of certain return flow temperatures

1. heat emission to heating system by heat exchanger (if return flow temperature <55°C)
2. 100% year-round free cooling because of high system temperatures (60/50°C) via dry cooler or ventilations system
3. usage of existing cooling system if necessary when modification for further redundancy (n+1)

- fail safe option: usage of emergency cooler on top of rack (air conditioning in room necessary)



USE CASE: DEUTSCHE TELEKOM BONN

TECHNICAL DATA:

Nodes
10

IT power up to
10 kW

Saved cooling costs
2,977 €

Saved heating costs
1,832 €

GOAL:

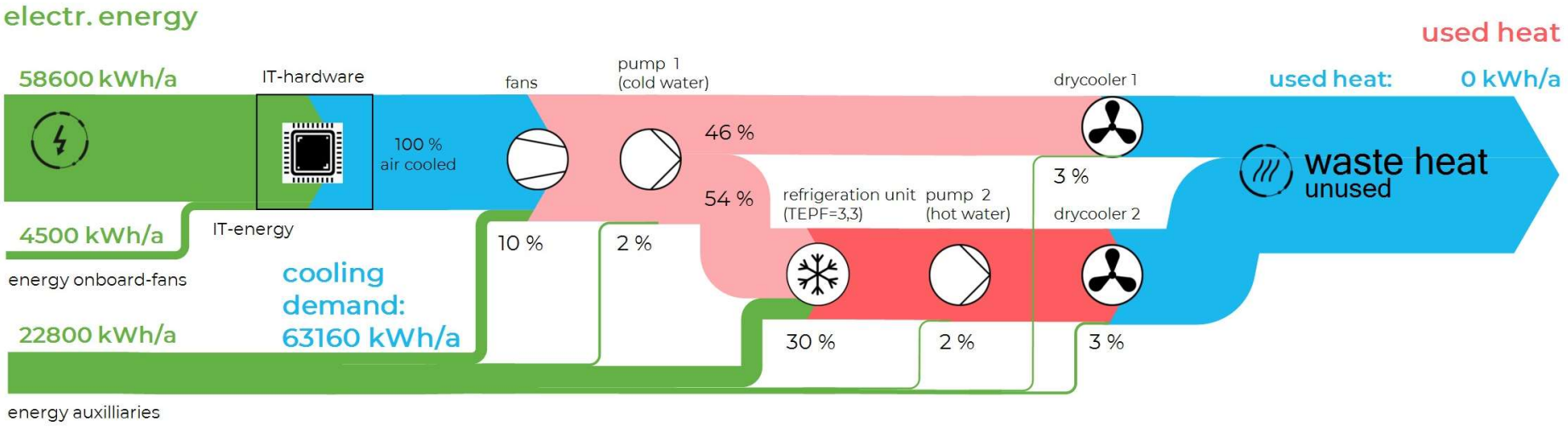
- installation of a sustainable gaming cloud

CUSTOMER:

branch: telecommunication
products: technical networks
year: 2020

USE CASE: DEUTSCHE TELEKOM BONN

INITIAL STATE: AIR COOLING



CUSTOMER:

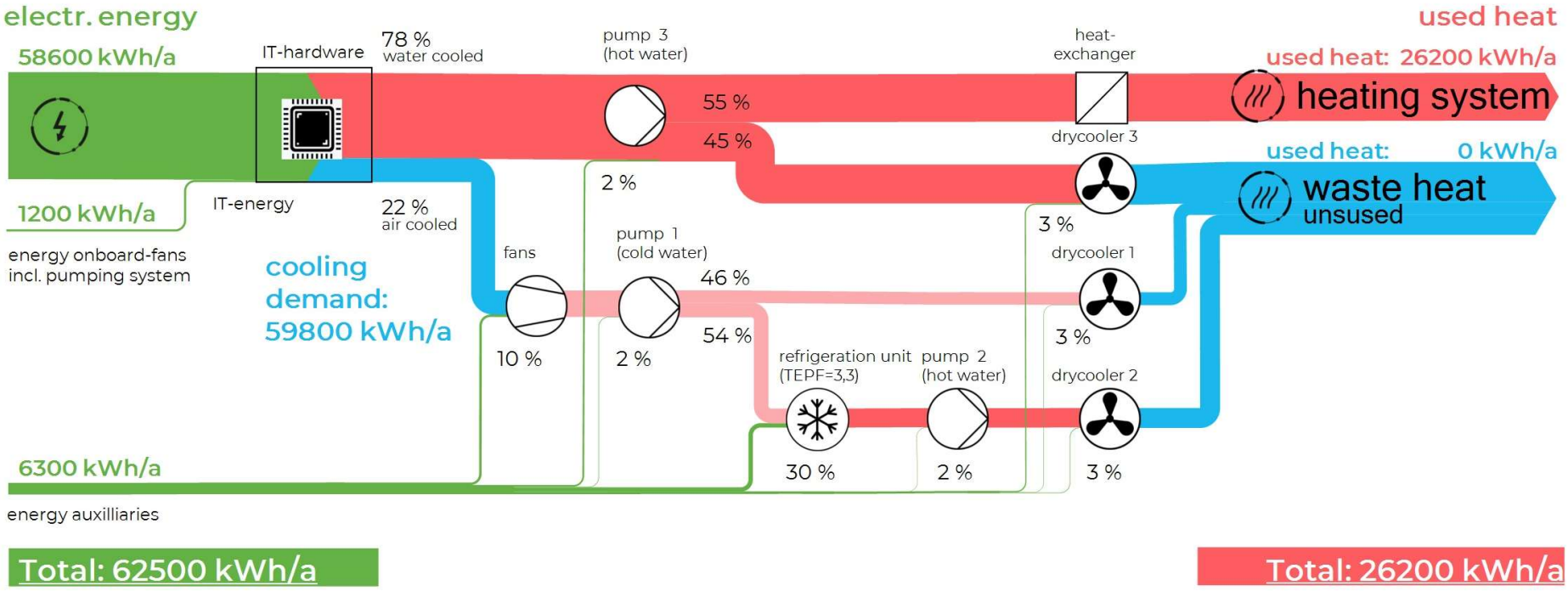
branch: telecommunication

products: technical networks

year: 2020

USE CASE: DEUTSCHE TELEKOM BONN

ENERGY SAVINGS WITH HOT WATER COOLING



USE CASE: DATA CENTER CONTAINER VATTENFALL

TECHNICAL DATA:

Containers
2

IT power per container up to
275 kW

Internal temperatures up to
63°C

Racks per container
4

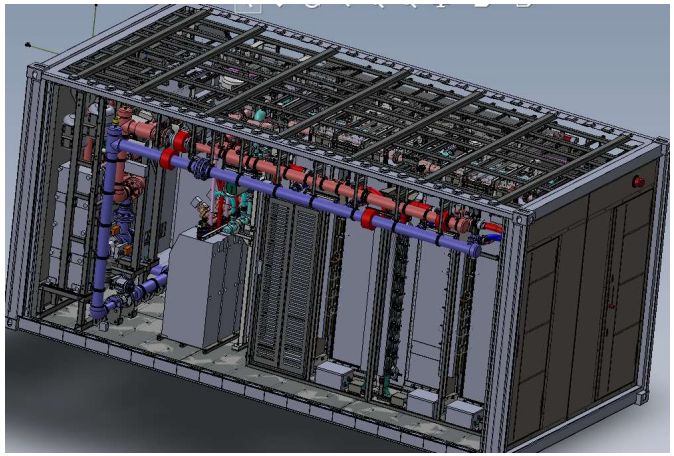
GOAL:

- installation of a new business model for utility, integration of heat into district heating

CUSTOMER:

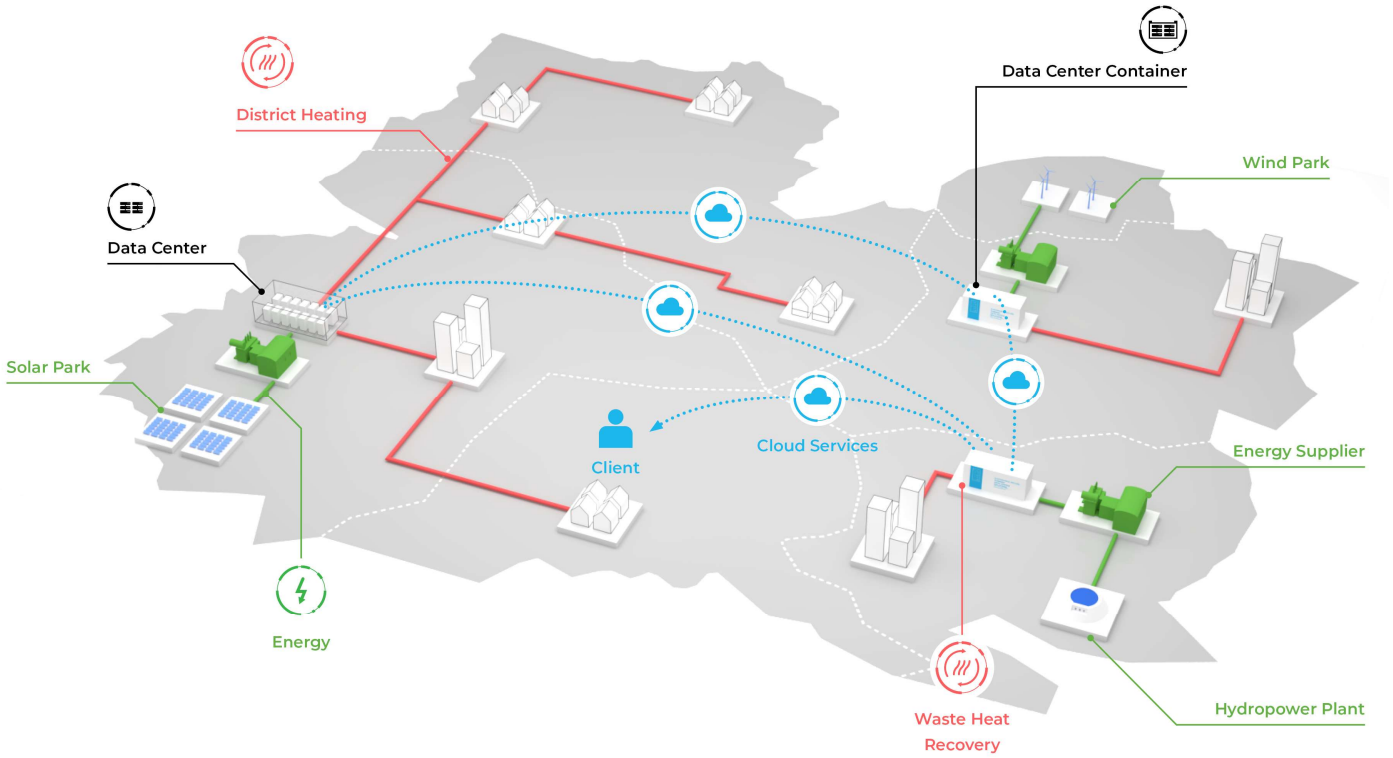
VATTENFALL

branch: utility
products: energy
year: 2020



OUR VISION

DIGITAL INFRASTRUCTURE



Dr. Jens Struckmeier

CTO & Founder

+49 351 479 367 07

jens.struckmeier@cloudandheat.com

DEUTSCHER RECHENZENTRUMSPREIS 2019

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Contact

Zeitenströmung – Halle 15

Cloud&Heat Technologies GmbH

Königsbrücker Strasse 96

01099 Dresden

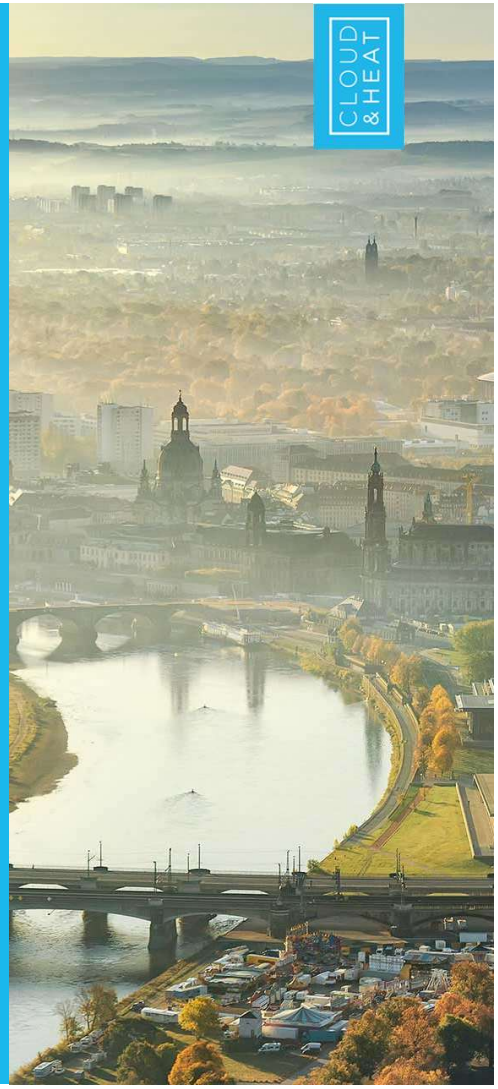
Germany

info@cloudandheat.com

+49 351 479 367 00

www.cloudandheat.com

Social Media




CLOUD
&HEAT
LET’S GET STARTED!

DIGITALIZATION

STRUCTURAL CHANGE IN LUSATIA