HOW TO OPTIMIZE DATA CENTRES FOR HEAT REUSE & DECARBONIZATION

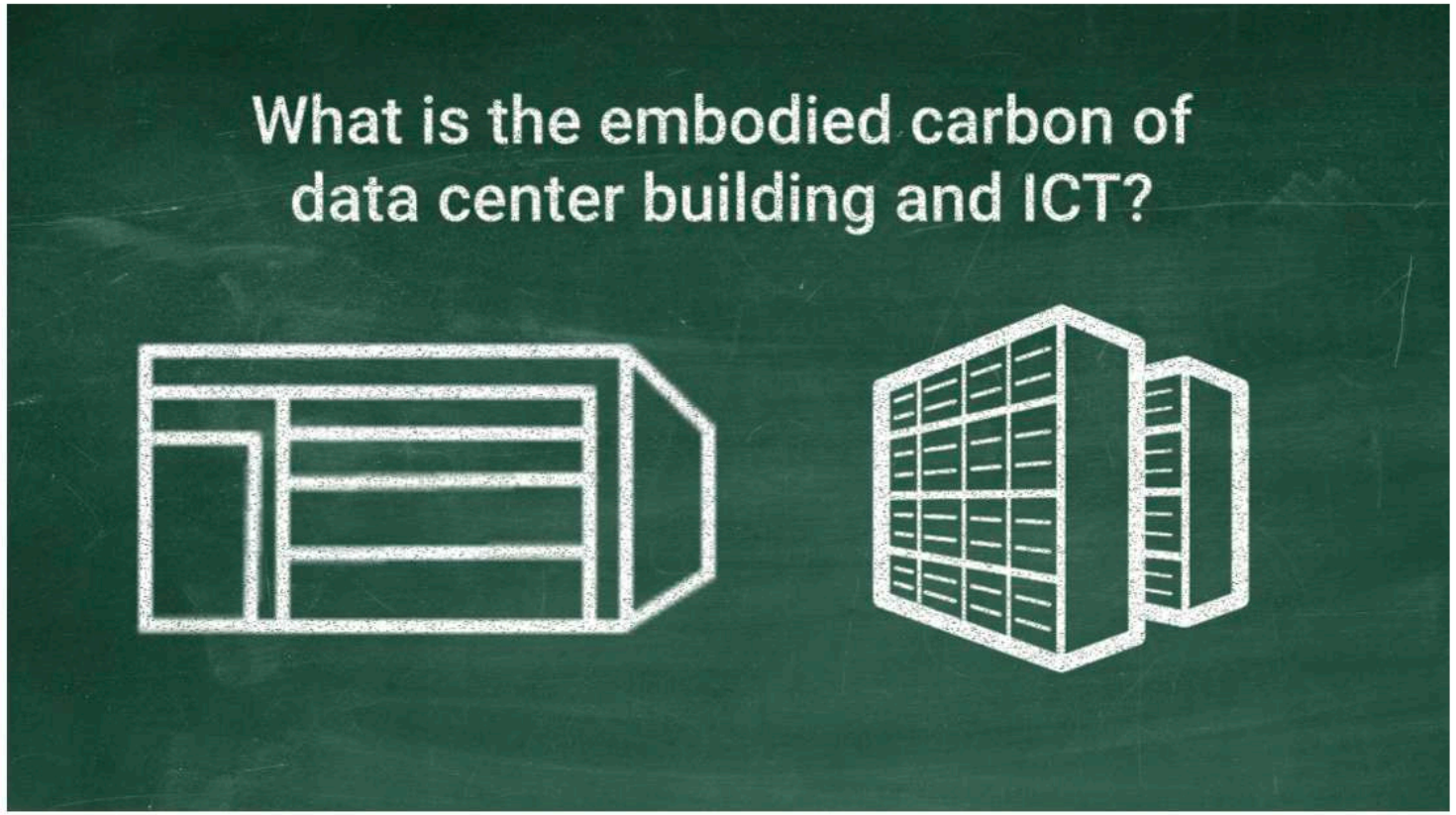
David Gyulnazaryan, CTO & Co-Founder of the DDP-Group

Stefan Frenzel, CEO & Co-Founder of the DDP-Group

05th of December 2024

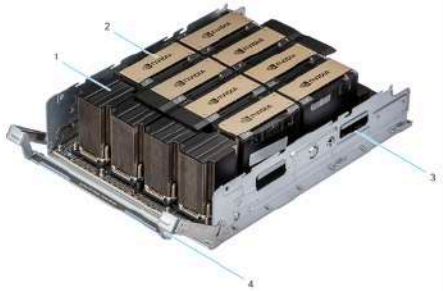
What is ratio of Scope 3 between data center building and IT equipment

IMPLEON



IT-load reduction

IMPLEON



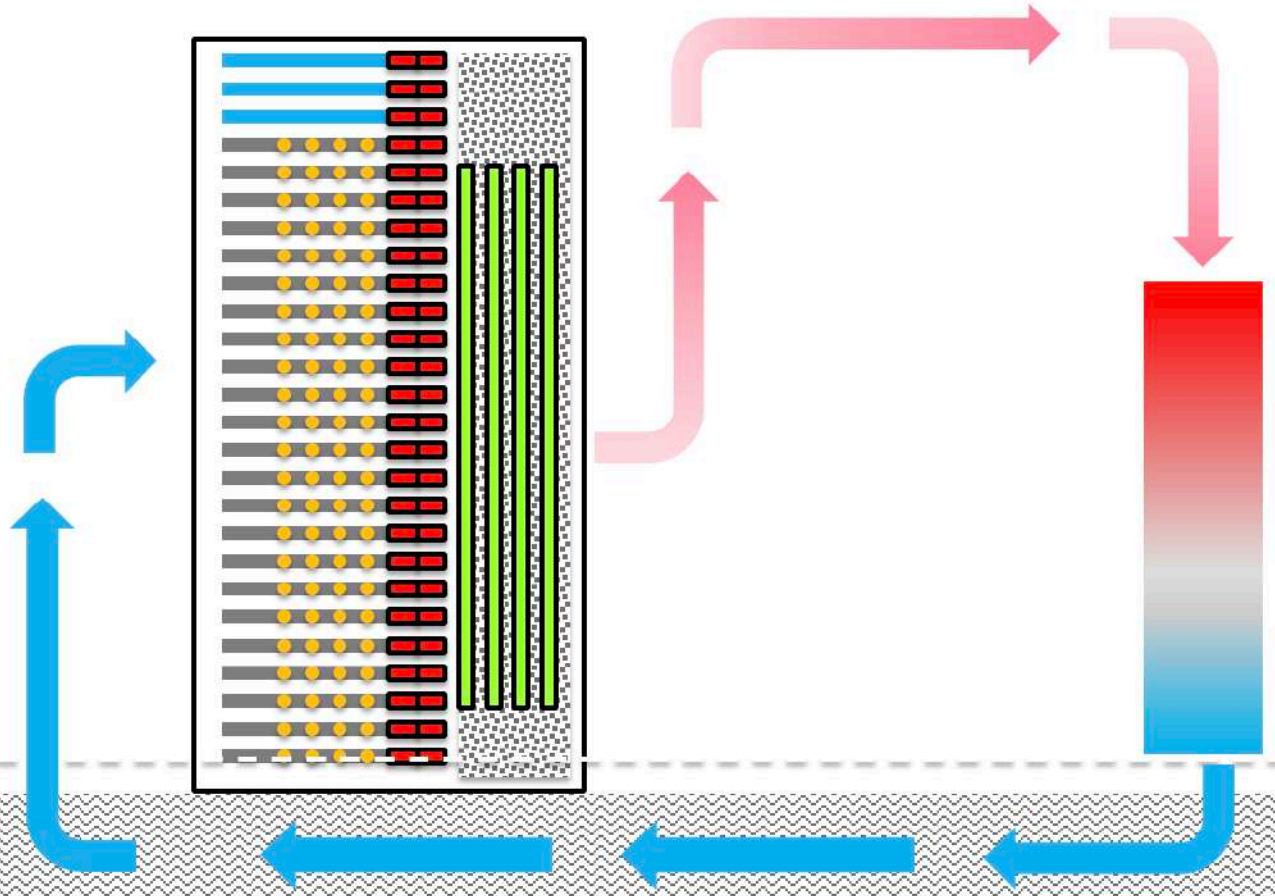
OCP Eats Rack Hardware

IMPLEON

No Longer Needed

2 x TOR Switches
4 x Pluggable optics
86 x PSU's
208 x 40mm Fans
4 x AC Power Strips
86 x IEC rear power cords
120 x RJ45 rear patch cords

N+1 CRAC units
Access Floor
Cables in floor



AI cluster with liquid heat transfer

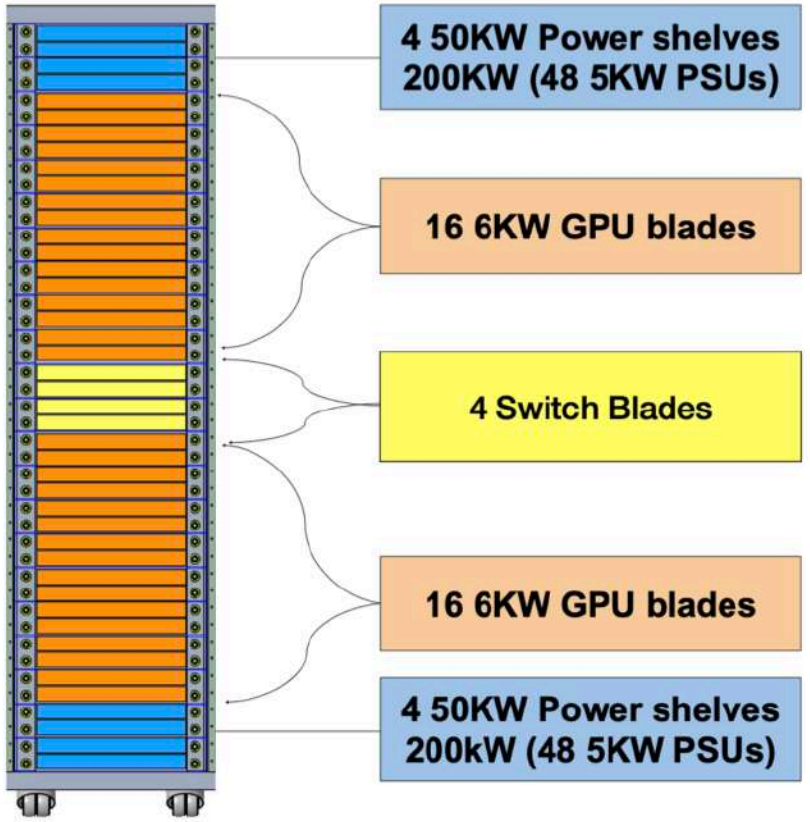
IMPLEON

24 Air-cooled Racks could be two 200 KW Liquid Cooled Racks
Same Total 400 KW Power (256 GPU @ 1.5KW)

OCP Racks Product Development Timeline

IMPLEON

32 1U GPU Blades @ 6KW
+ 4 1U Switch Blades@ 1KW
4 Switch Blades
Supports 64 3KW GPUs or
128 1.5KW GPUs, including
GPU, CPU, and NIC power

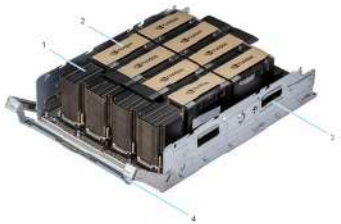


The most efficient heat transfer solution

IMPLEON

Cooling Medium/ Properties	Unit	Air	Water	HFE 7000
Density	(kg/m^3)	1.14	994.10	1400.00
Specific Heat	(kJ/kg. °K)	1.01	4.18	1.30
Latent Heat	(kJ/kg)	--	--	142.00
Volumetric Heat Capacity	(kJ/m^3 °K)	1.15	4153.35	198800
Typical heat Rise	(°K)	11.00	6.00	--
Volumetric Heat Transfer (HT) Content	(kJ/m^3)	12.63	24920.10	198800
Volumetric HT Ratio to Air			1973.43	15743.07
Volumetric HT Ratio to Water				7.98

Source. A Performance Assessment of Air, Cold Plates, and Two-Phase Immersion Cooling
Bharath Ramakrishnan et al, Microsoft, October 2021:

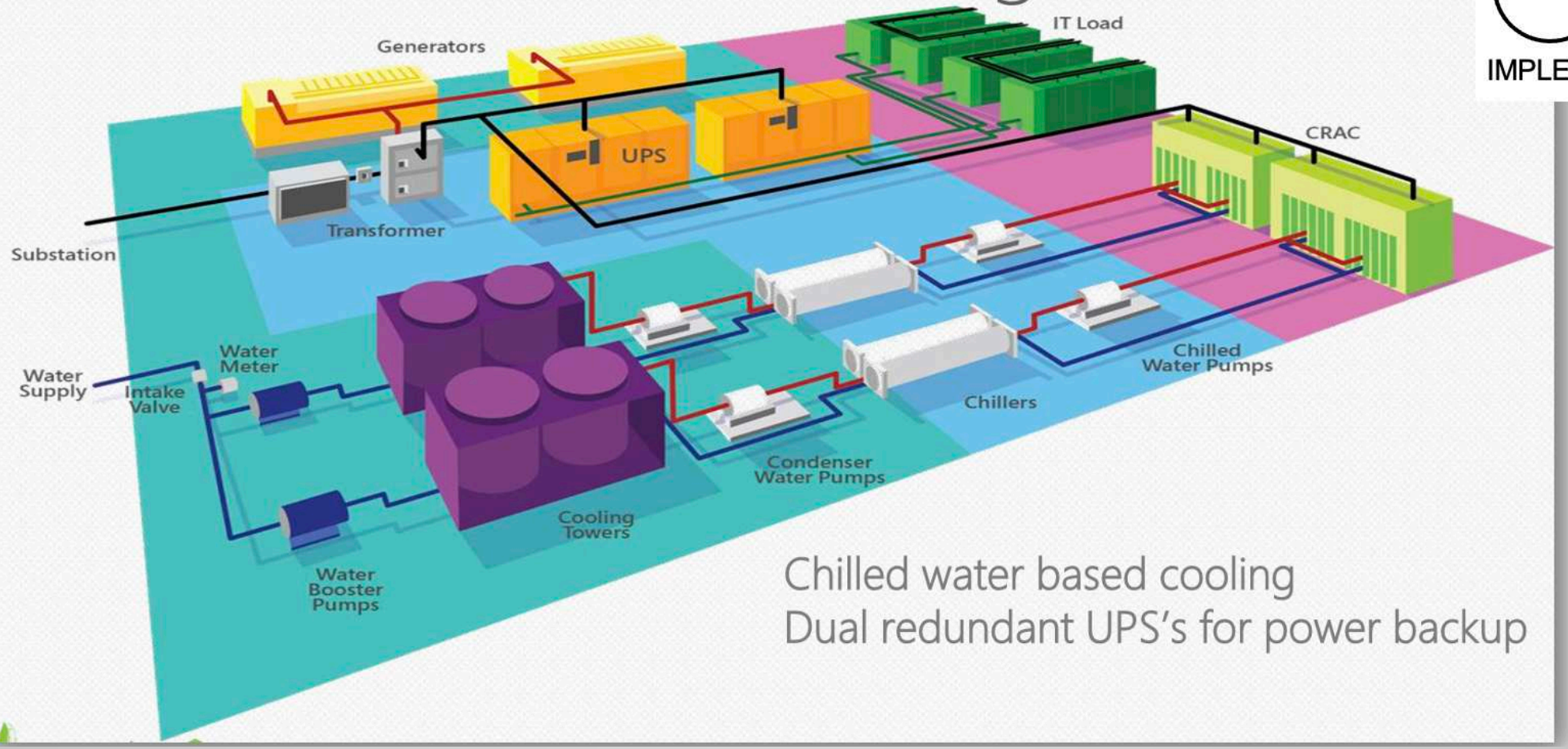


Air
690 577 l/min

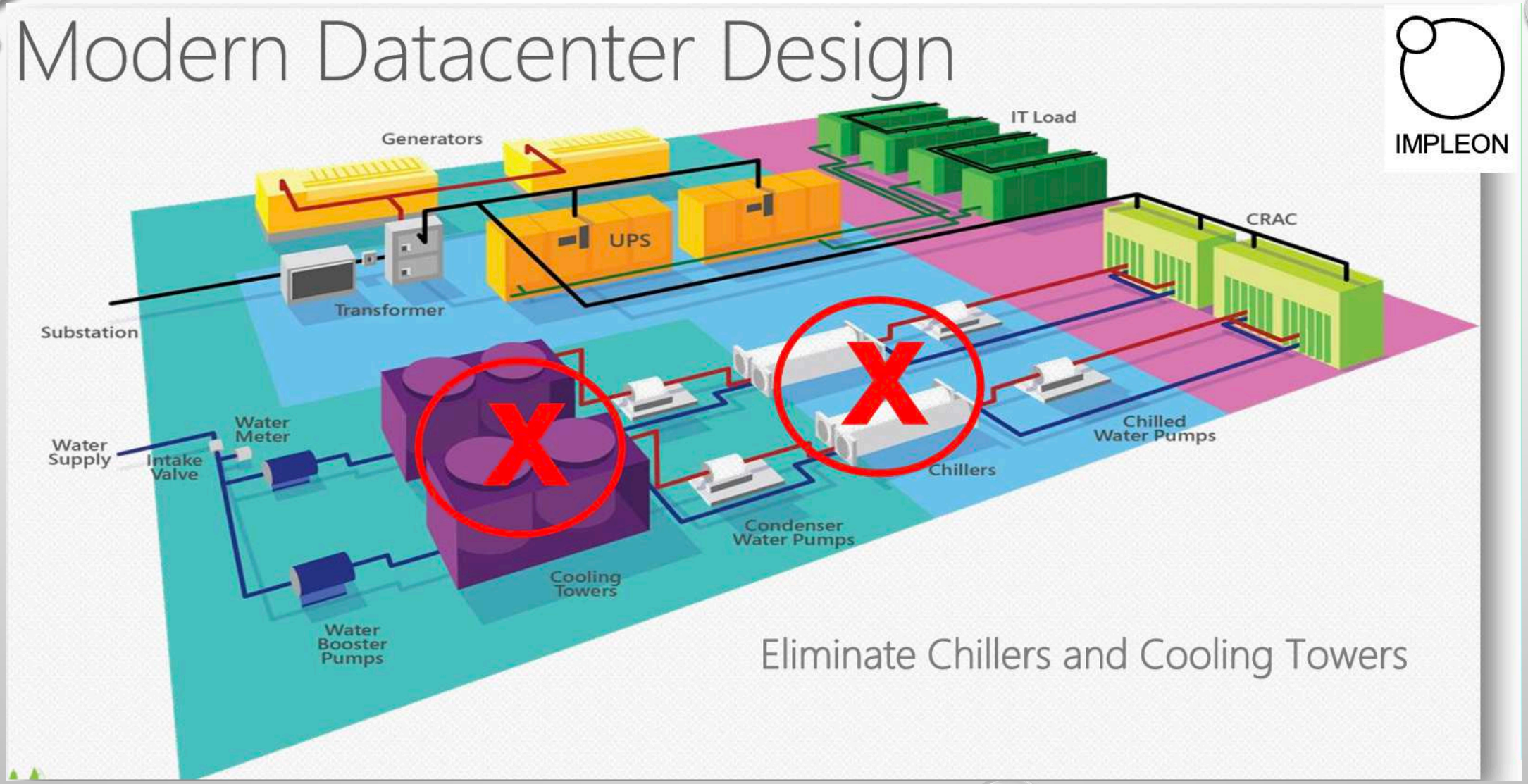
Single phase
on-chip
350 l/min

Two phase
on-chip
44 l/min

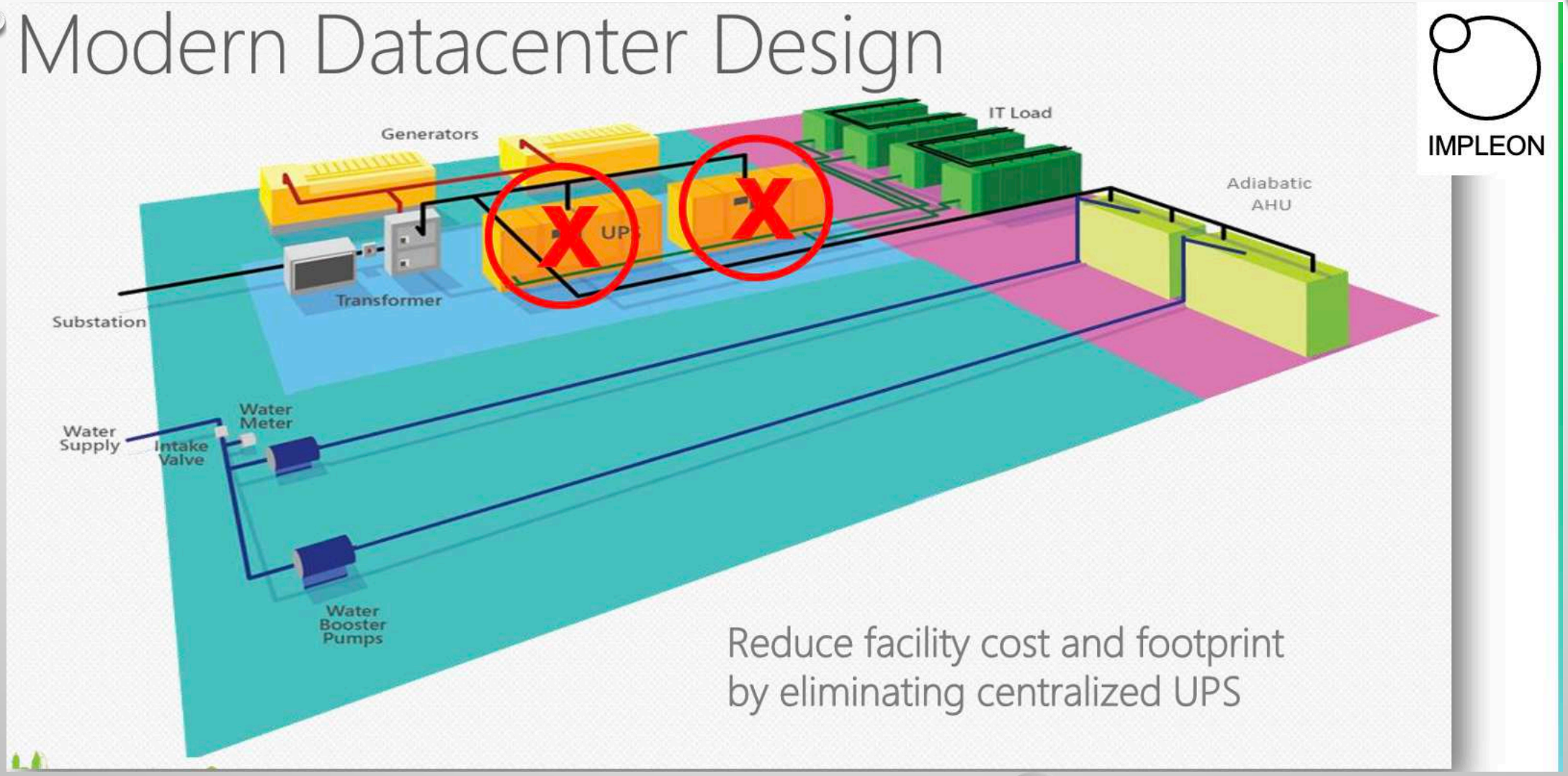
Traditional Datacenter Design



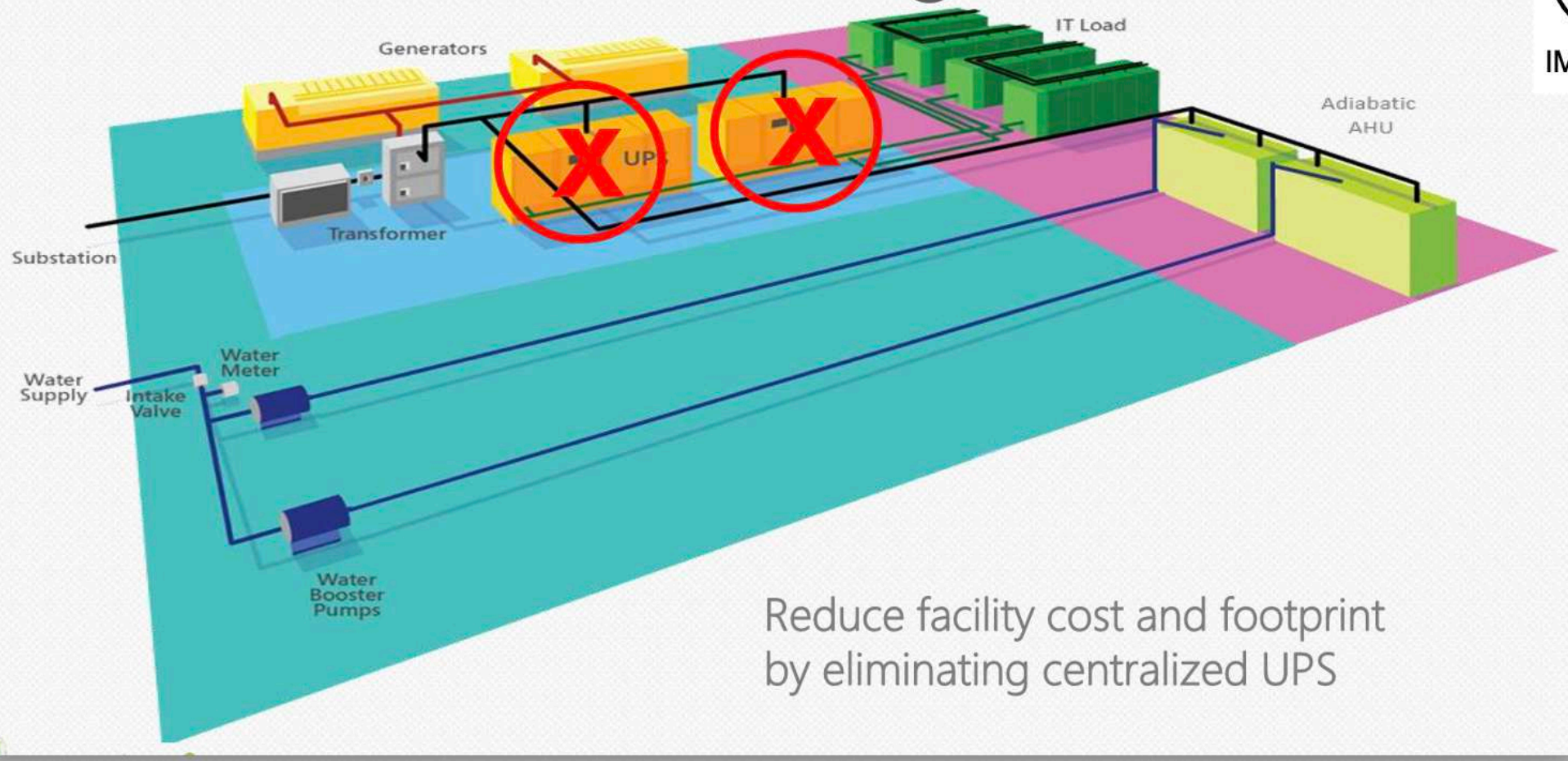
Modern Datacenter Design



Modern Datacenter Design



Modern Datacenter Design



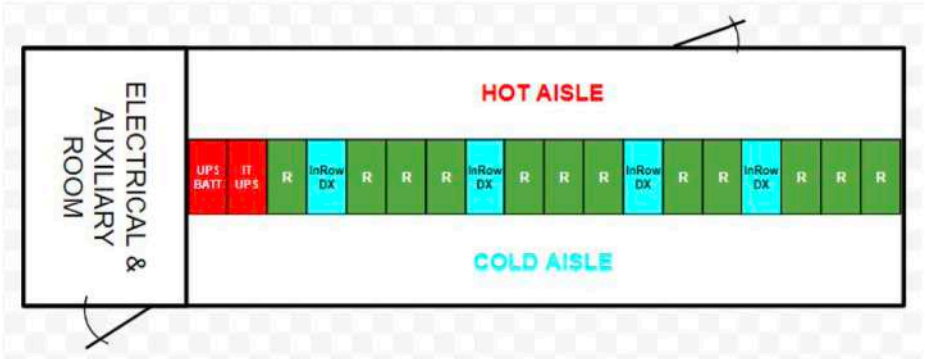
IMPLEON

MDC with liquid heat transfer

IMPLEON

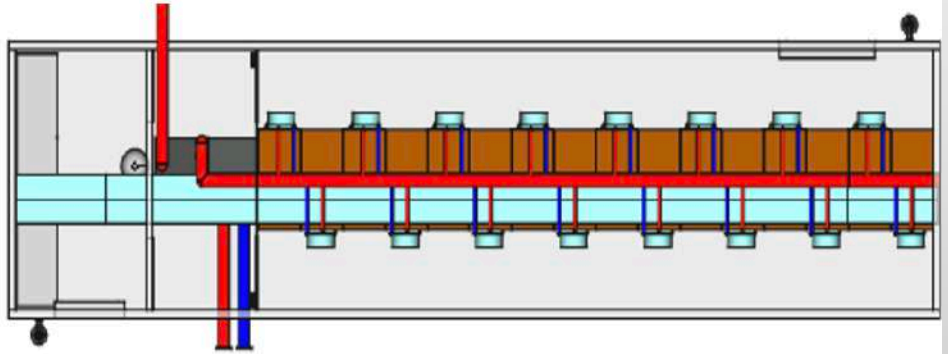
Data Centre with
Air cooled racks

i. Module with UPS



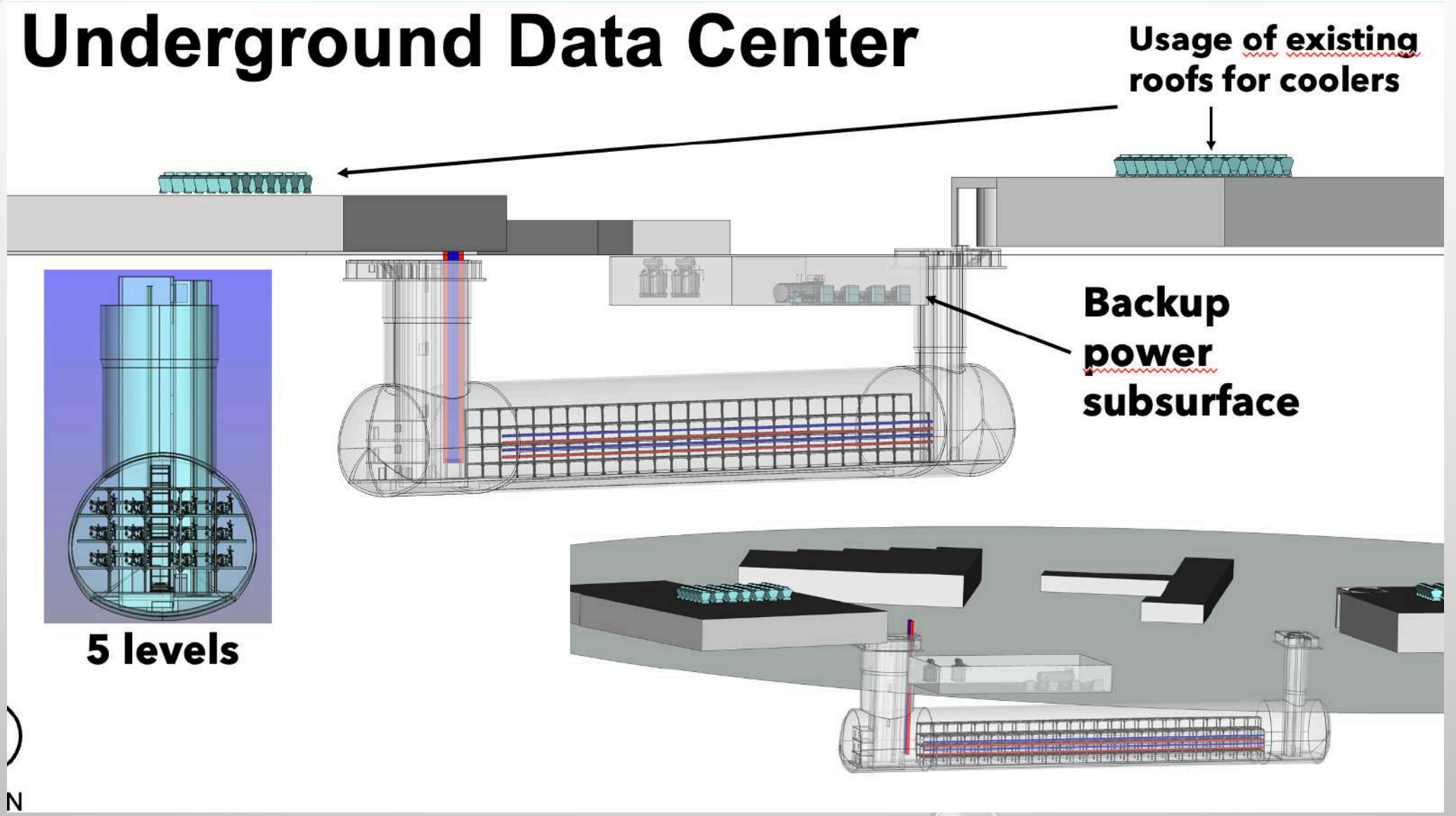
12 racks / up to 90kW

Data Centre with
Liquid cooled racks

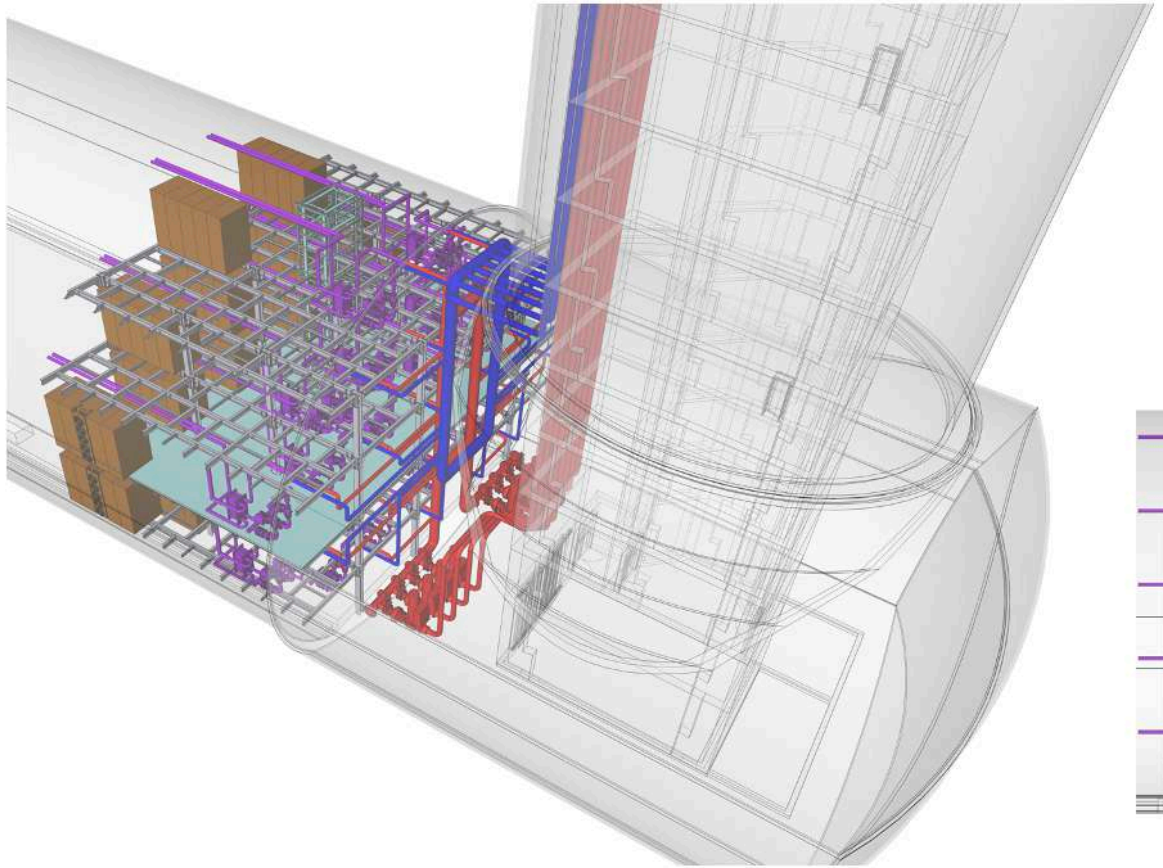


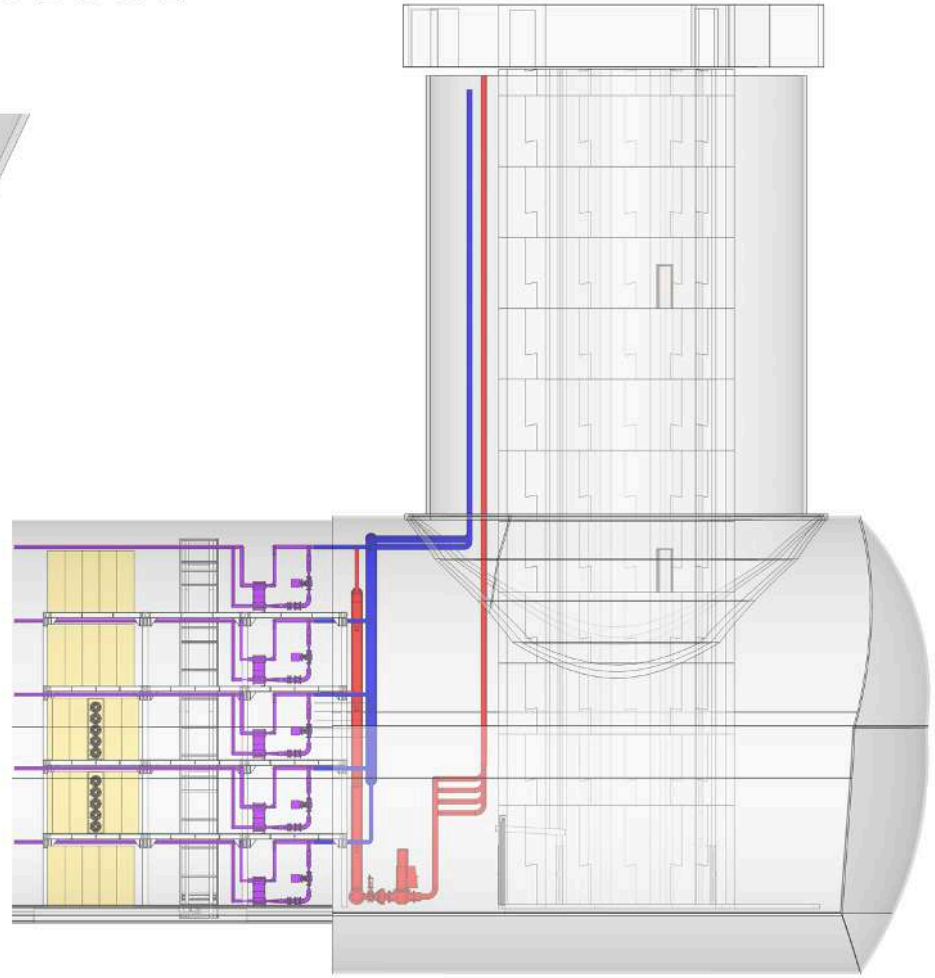
16 racks / up to 1800kW

Underground Data Center



Underground Data Center





Flexible facility design

Air cooled
Door HX

(a – 1050kW)
75 racks/row

Flowrate 96 m3/h
Inlet 34°C
Outlet 44°C

HEX system for 75 racks /row

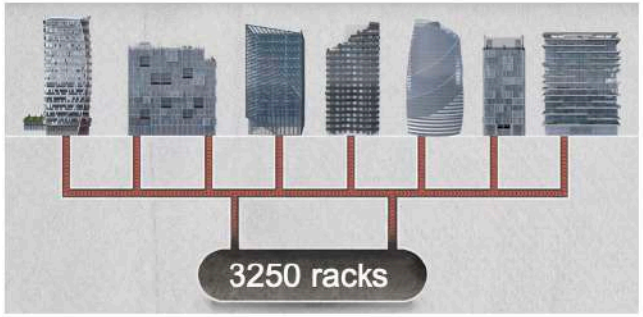
Hybrid solution
Door HX & cold plates in series

(b – 3750kW)
75 racks/row

Flowrate 96 m3/h
Inlet 34°C
Outlet 70°C

(a – 45MW)
3250 racks

Flowrate 4800 m3/h
Inlet 40°C
Outlet 32°C



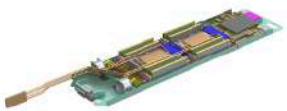
Heat reuse with district heating

(b – 162MW)
3250 racks

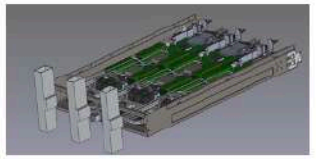
Flowrate 4800 m3/h
Inlet 61°C
Outlet 32°C

Impleon – Create open source solution for recycle and reuse

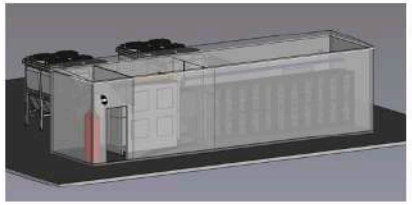
IMPLEON



Server design for liquid cooling



Rack design



Facility design

Ecosystem design with heat reuse

RACK DENSITY & DATA CENTRE SURFACE

Air cooled rack

Up to 15 kW

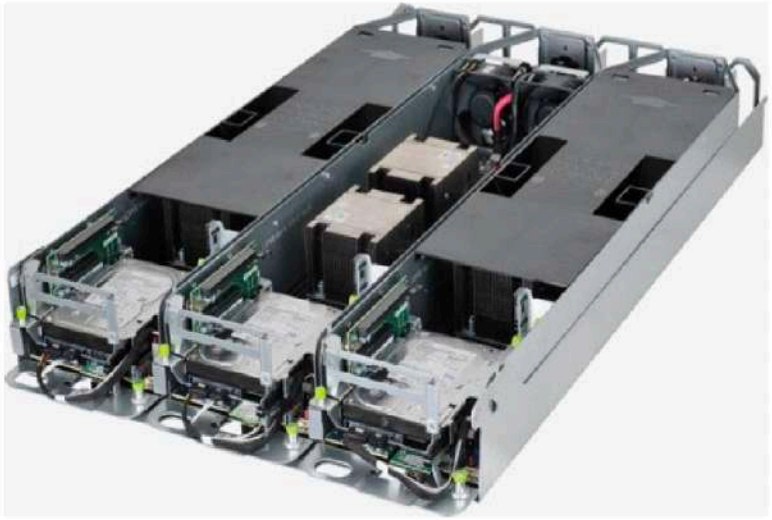
Liquid cooled rack

Up to 100 kW .....
could be >120 kW with AI

HIGHER FACILITY WATER TEMPERATURE

Air cooled server

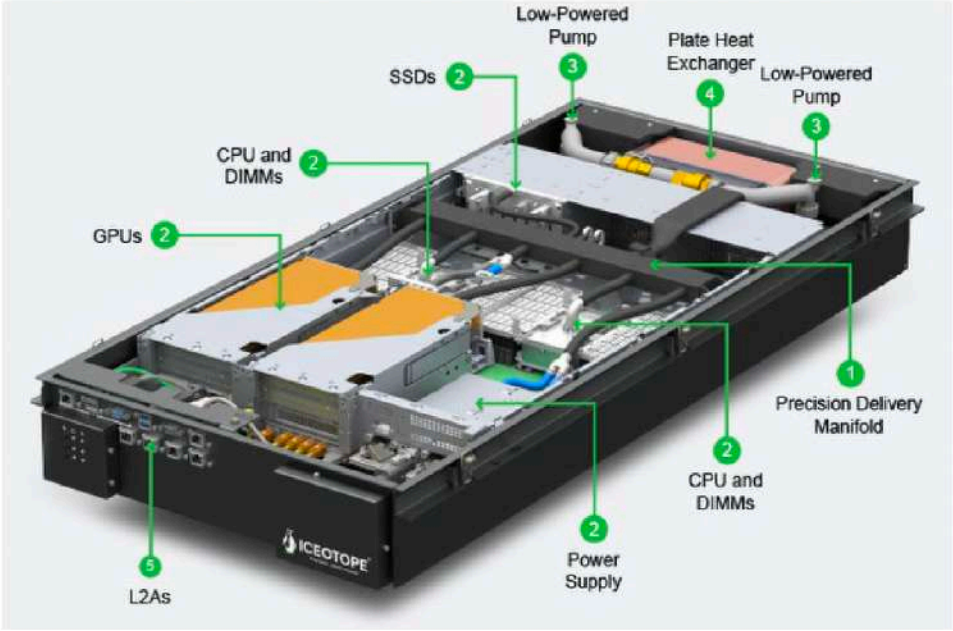
Fans up to 35%



Facility water inlet 20°C

Liquid cooled server

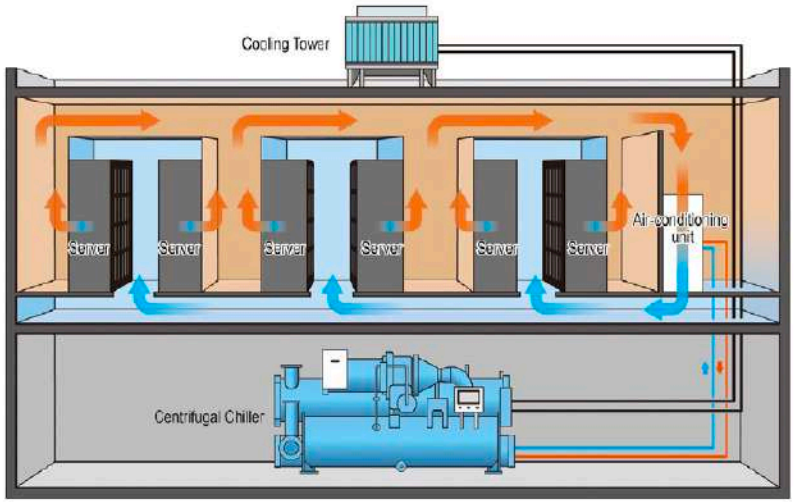
No fans



Facility water inlet 40°C

LESS ENERGY INFRASTRUCTURE

Air cooled solution



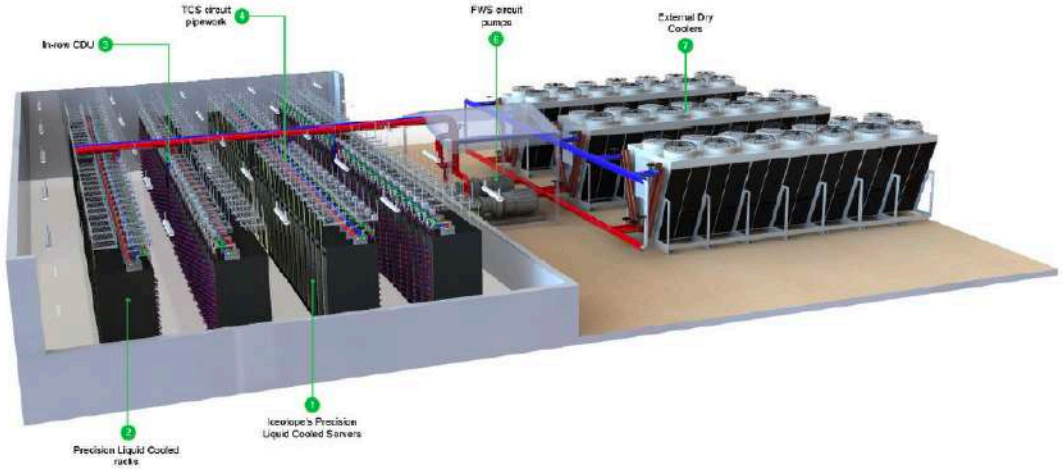
Servers with fans 2 MW

CRAH, Chillers, CT 0,8 MW

UPS 0,2 MW

Power input 3,0 MW

Liquid cooled solution



Servers without fans 1,6 MW

Dry coolers 0,1 MW

UPS 0,1 MW

Power input 1,8 MW

SUBSEA DCS - GREAT OPPORTUNITY OFF- & ON-SHORE

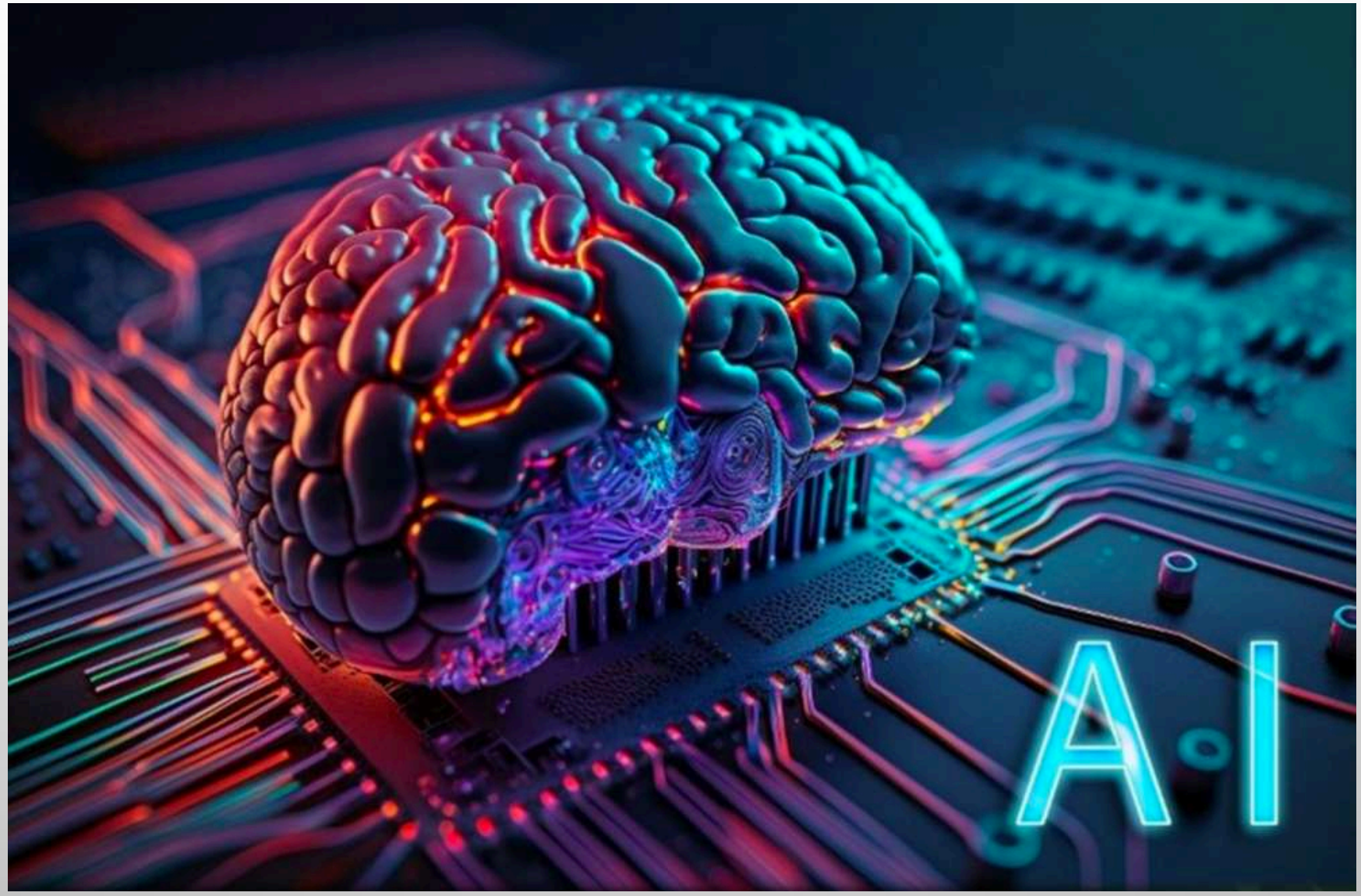
On-Shore

Off-Shore

Subsea datacenters supported by liquid cooling with up to 3MW (normal edge dc is usually max. 1MW) in **lakes, rivers** or **channels** in the heart of the cities all over Europe!

HEAT REUSE IN URBAN AREAS – SUPPORING NETZERO!

AI FUTURE POTENTIAL



NEXT-GEN CPUS & GPUS FUELING THE AI REVOLUTION

AI FUTURE POTENTIAL

What is Changing Now

Liquid cooled AI Datacenters are new design focus

Gigawatts of liquid cooled datacenter in development

Large deployments require standardized solutions

Big transition from previous bespoke custom designs

Holistic design approach from chip to rack to building

What is the best way to move heat out of the datacenter?

The era of liquid cooled Datacenters has arrived with AI

MANY THANKS FOR YOUR ATTENTION

Stefan Frenzel
frenzel@digitalesmarketingexperte.de
https://www.linkedin.com/in/stefanfrenzel/

David G.
david@impleon.com
https://www.linkedin.com/in/david-co2/