



CARRIER YOUR PARTNER IN DATACENTER PROJECTS



29th September, 2022 – Tim Ashton, Major Projects Business Development Director

Key challenges Data Center projects raise
in the application of HVAC solutions

How a holistic solution approach can
provide both benefits at the design stage
and ongoing operation of the system.

TOPIC



Carrier Global Corporation is a World Leader in HVAC



Inventor of air conditioning



One of the largest engineering teams on the market



~ 58,000 employees



Over 118 years of experience



\$20.6B 2021 net sales



Carrier Corporation Solutions Overview

CLIMATE CONTROLS



- Chillers and boilers
- Air-handling units
- Variable refrigerant flow (VRF) systems
- Integrated controls
- Service

FIRE SAFETY



- Detection and alarm
- Integrated incident management
- Suppression

SECURITY



- Access control and credentialing
- Video management systems
- Electronic locks

BUILDING AUTOMATION



- Building automation
- Energy reporting
- Dashboards
- Services



A global ranking of 50 companies meeting society's greatest challenges through transformational business initiatives

HVAC Design and Manufacturing in Europe

● **Montluel** 
Commercial Chillers

● **Culoz** 
Airside products

● **Vence** 
Control systems & Connected services

● **Montilla** 
Rooftop & Light commercial chillers

Nordics Regional Support Office

- **Goteborg**
Regional Support Office
- **Stockholm**
Regional Support Office
- **Malmo**
Regional Support Office
- **Helsinki**
Regional Support Office



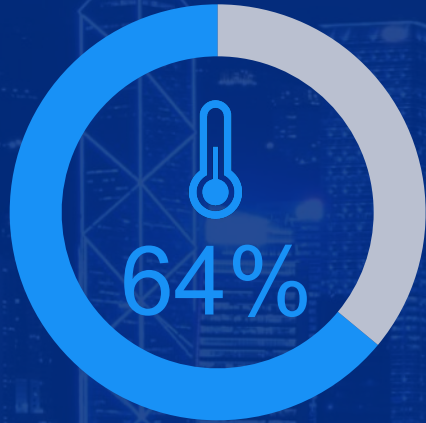
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Centres
of Excellence



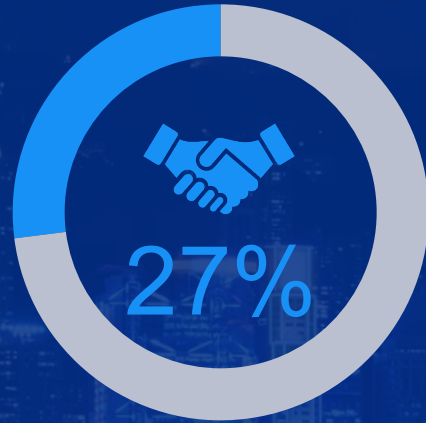
3
Production
Sites



HVAC Europe business



EQUIPMENT
 Hydronic terminals
 Chillers / Heat pumps
 Air Handling Units
 VRF / Split systems
 Controls



SERVICE
 Maintenance contracts
 Modernisations
 Repairs
 Remote monitoring
 Spare parts



RENTAL
 Dehumidifiers
 Chillers
 Rooftops / AHU
 Water pumps
 Boilers
 Generators



- France
- UK
- Iberica
- Germany
- Benelux
- ROW
- Chillers
- Airside
- Package
- Other HVAC
- Service
- Rental



~3,700
 EMPLOYEES



TOSHIBA *
 Leading Innovation >>>



Proprietary and Confidential

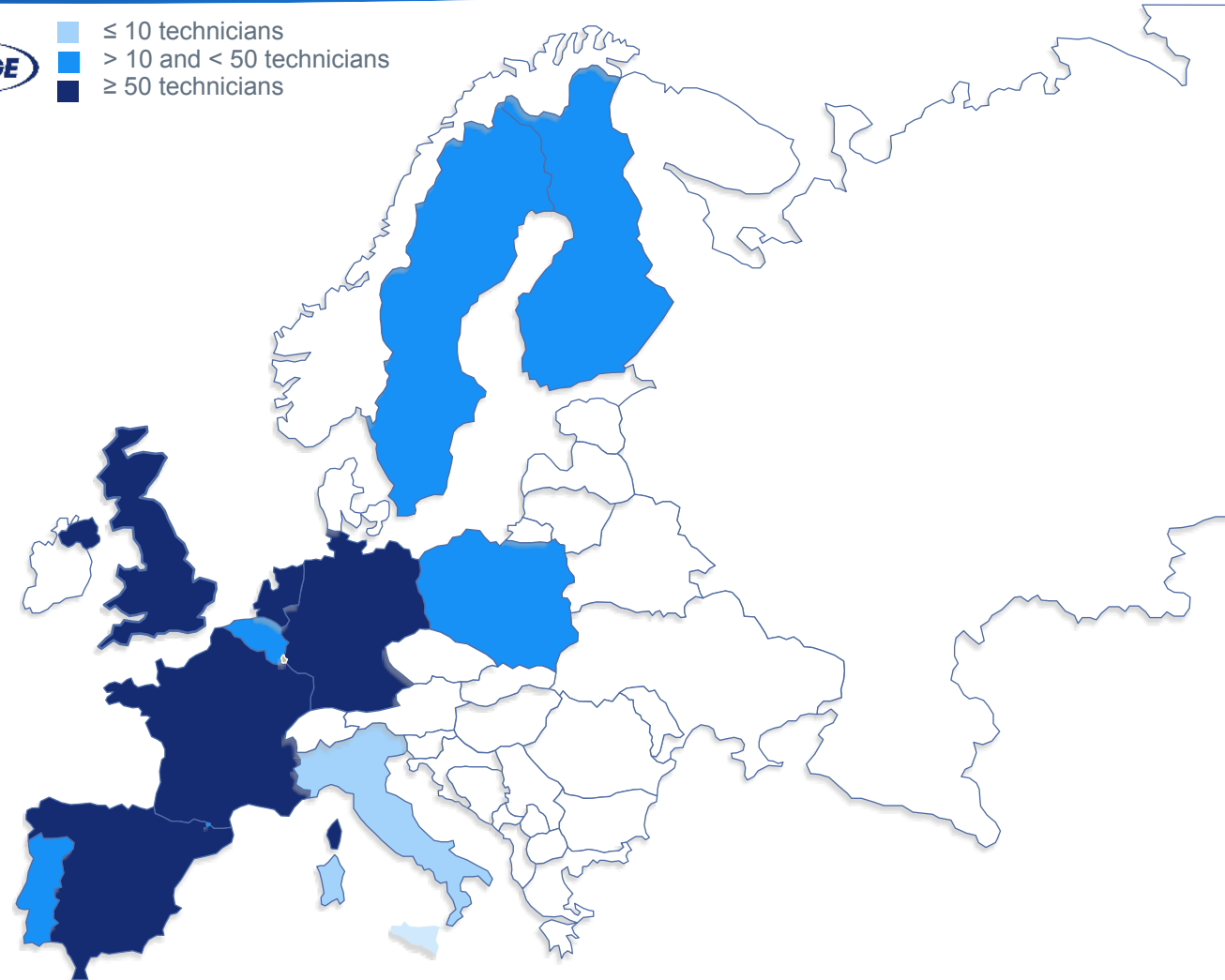
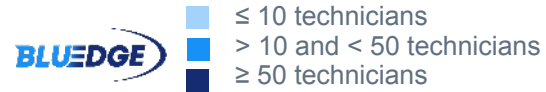
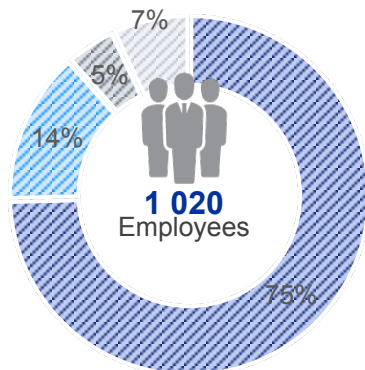
* Only in the UK

CARRIER SERVICE IN EUROPE

Footprint

- 11 Countries
- 61 Branches
- 1 020 Employees
- 25 000 Units under maintenance

EMPLOYEES IN EUROPE



- Technicians
- Service sales rep
- Rental sales rep
- Back office

**SOLUTIONS FOR H
EFFICIENCY DATA
OPERATIONS**



Carrier's Key Data Centre Challenges and focus



Reduce operating expenses



Optimize Capex



Improve infrastructure management



Mitigate risk

Broad & leading products & systems offering




Customer tailored solutions

Lifecycle management services

AdvanTEC

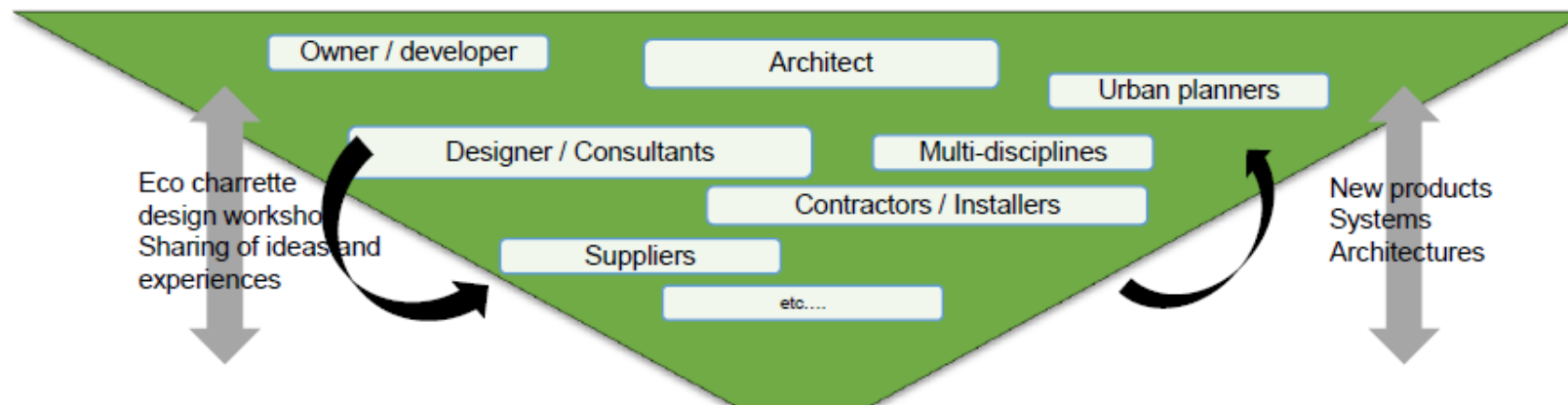
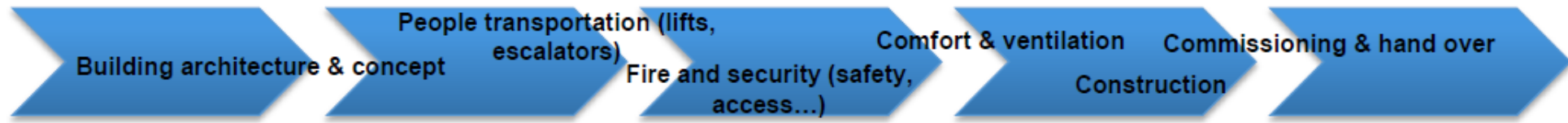
BLUEDGE

Safety & Energy



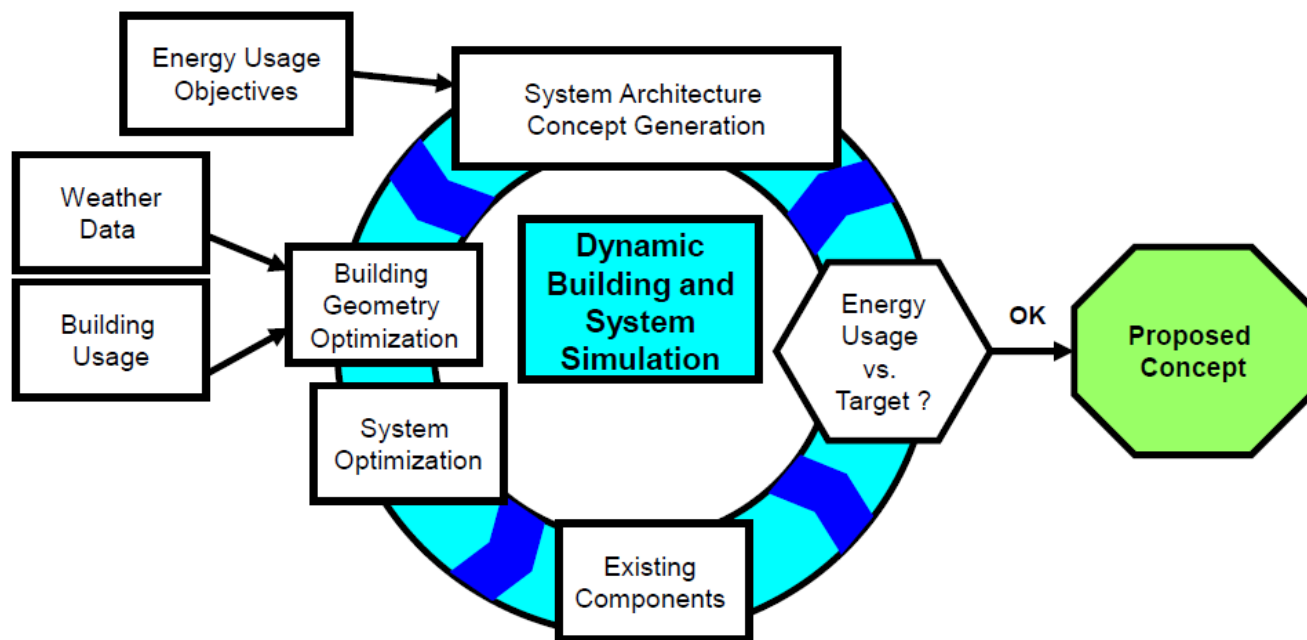
Conventional HVAC System design –v- Holistic

CONVENTIONAL STEP BY STEP 'TRADITIONAL BUILDING DESIGN'



TRUE HVAC SYSTEM LIFE CYCLE OPTIMISATION CAN ONLY COME FROM CHANGING TO A HOLISTIC TEAM DESIGN APPROACH

Integrated Holistic Design Delivery



TEAMWORK TO OPTIMIZE BUILDING & HVAC DESIGN AND INTEGRATION

- ❑ Delivers Best Optimised HVAC Data Center solution
- ❑ Operating expenses
- ❑ Capital investments
- ❑ Operational processes
- ❑ Risk management
- ❑ etc

Carrier HVAC Solutions for Data Centers



EQUIPMENT

- Chillers
- Air handling units
- Close control units
- Fan coil
- Heat exchangers
- Dry coolers
- Rooftops

SERVICE & RENTAL

- Connected services
- Connected technicians
- DCIM & Plant room management
- Rental



30 XF-Z
Air-cooled variable-speed screw chiller



30RB / 30RBP
Air-to-air scroll liquid chiller



30XWV-ZE
Water cooled screw chiller



61XWH-ZE
High-temperature water sourced heat-pump



50CO/W
Close control unit



39CP
Air handling unit



39CZ
Air Handling Unit

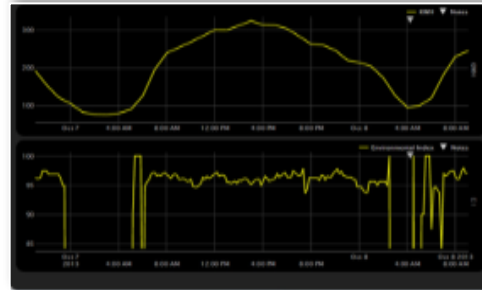
DESIGN, BUILD & CONSULTANCY

- High density cooling solutions
- All Air cooling systems
- Integration of data centers for Smart Cities
- CFD system modeling

Some results of Holistic Data Centre HVAC solutions



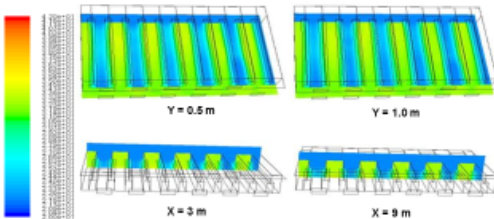
HIGH DENSITY SOLUTIONS



ENERGY OPTIMISATION



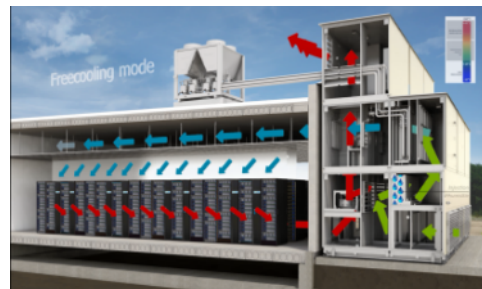
CFD MODELLING



°C The max temp. in the whole domain is lightly lower than that in th the resistance coef. of computer is relatively increased compai ceiling, the temperature distribution in hot corridor is more uniform.

PROPRIETARY AND CONFIDENTIAL

ALL AIR SOLUTIONS



CONNECTING DATA CENTRES TO SMART URBANISATION

- 1 High density Natural refrigerant cooling solutions
- 2 All Air-cooling system w /integrated supplementary mechanical cooling options
- 3 Repurpose data center heat for district heating / smart urbanization
- 4 • New Air Cooled Chiller with Glycol Free Hydronic Free cooling
- 5 DCIM & Plant System Optimization

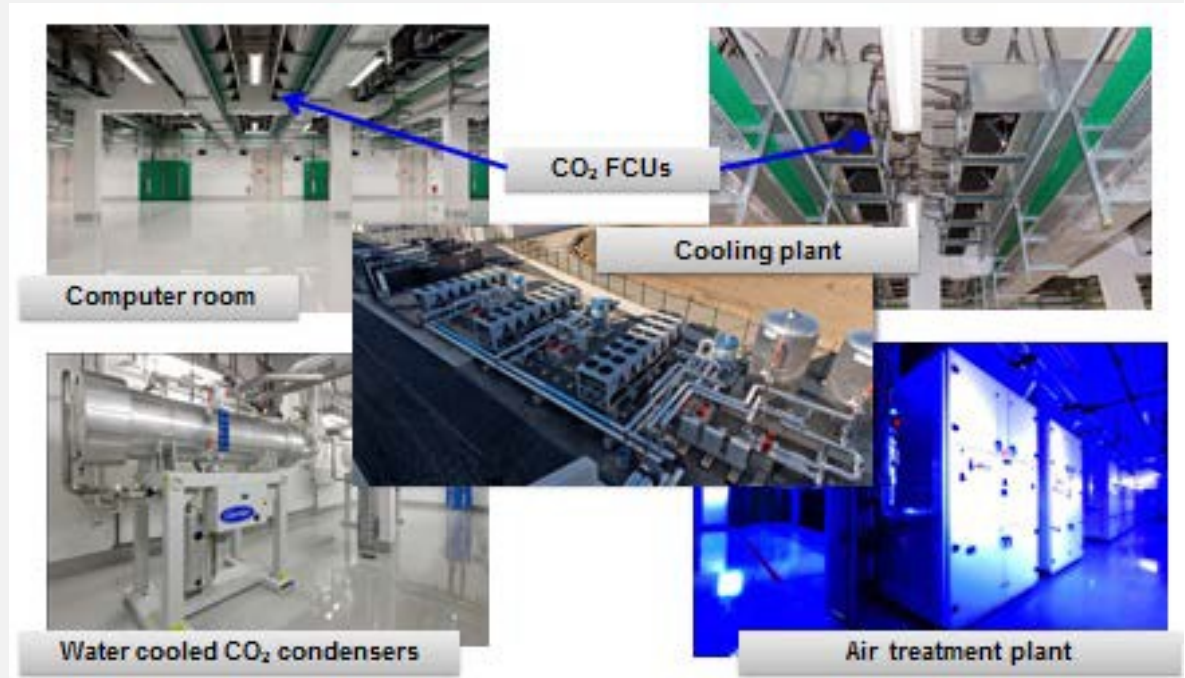
HYBRID CO2 HIGH DENSITY, HIGH EFFICIENCY RACK COOLING

THE CHALLENGES



Increase power density, flexibility & reliability
 $1.5kW/m^2$ to $3kW/m^2$
Reduce HFC usage
Optimize energy use
Eliminate water in IT room

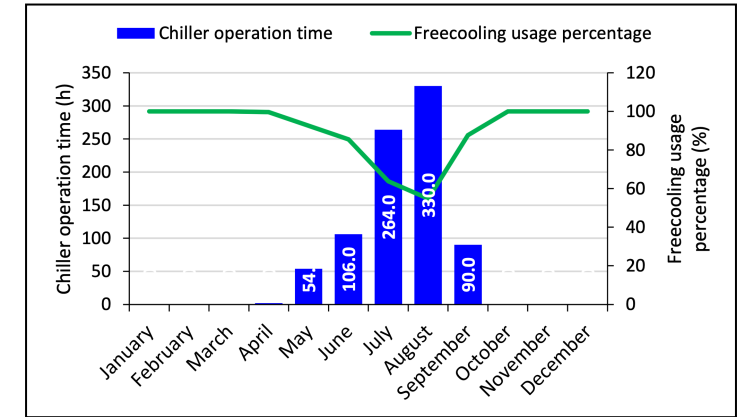
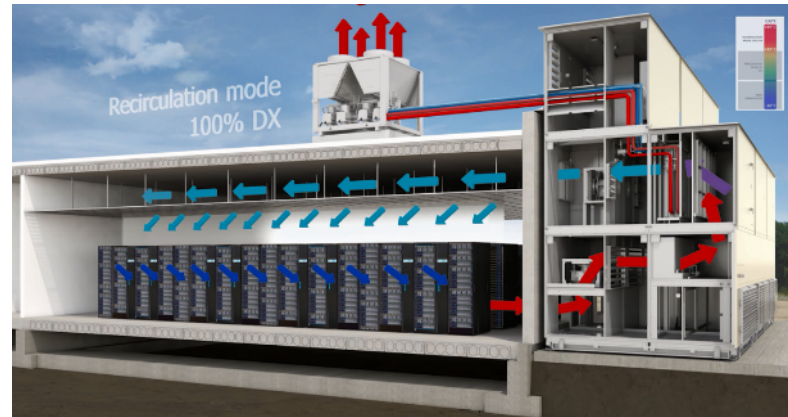
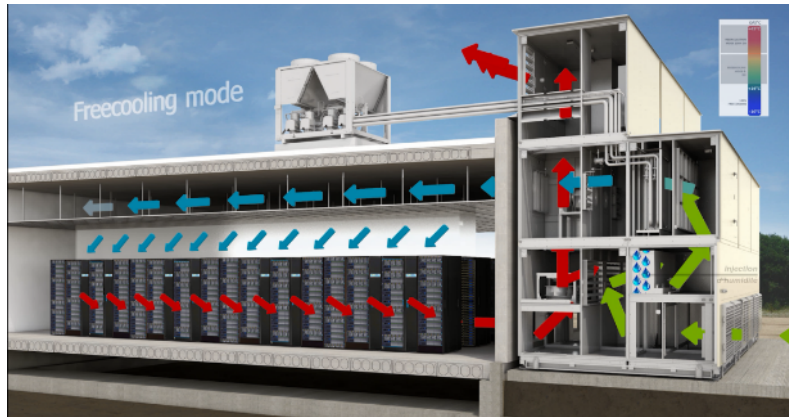
THE SOLUTION



Data COMPLETE

- Improve system redundancy
- Eliminate hotspots
- Obtain 10% additional energy savings

All Air Modular Free Cooling – Direct Air



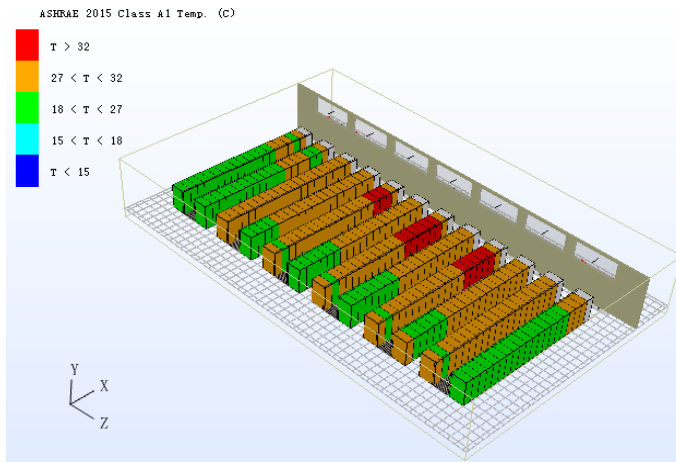
Chiller operates ~800 hours/year

- ❑ Largest colocation services provider in France
- ❑ Lower operating cost through free cooling
- ❑ Scalable cooling infrastructure
- ❑ Higher aisle operating temperatures



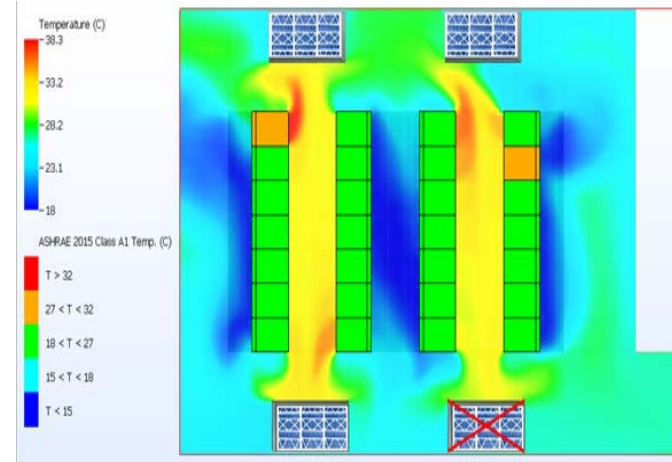
- ✓ Cooling system based on all fresh air solution coupled with DX condensing unit
- ✓ Modular design
- ✓ Ceiling cold air diffusion (compatible with floor diffusion)
- ✓ Extremely high efficiency, Annual EER 10.8 (0.325 kW/RT)

Design Verification & Optimization



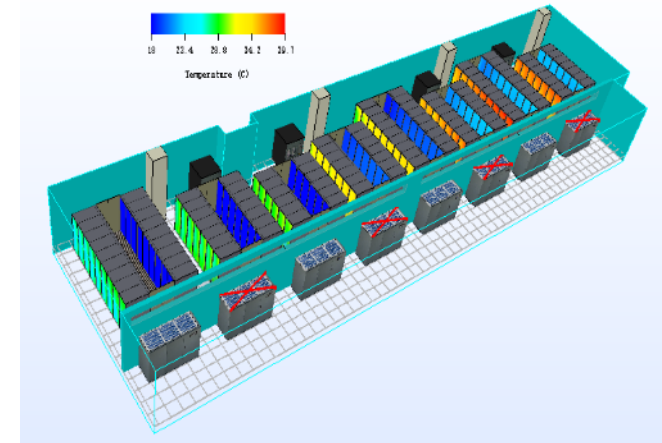
- AHU sizing and layout analysis, to verify the AHU cooling capability
- Simulation with CFD, to achieve proper temperature & airflow distribution

Fault-tolerant Verification



- Hot spot identification
- Analysis AHU redundancy under failure
- Transient simulation for safety redundancy verification

Energy Optimization



- Over-cooling identification for energy saving
- AHU control optimized operation
- Integrated with chiller plant system for further optimization

Data Hall HVAC Airside Verification & Optimization with CFD simulation

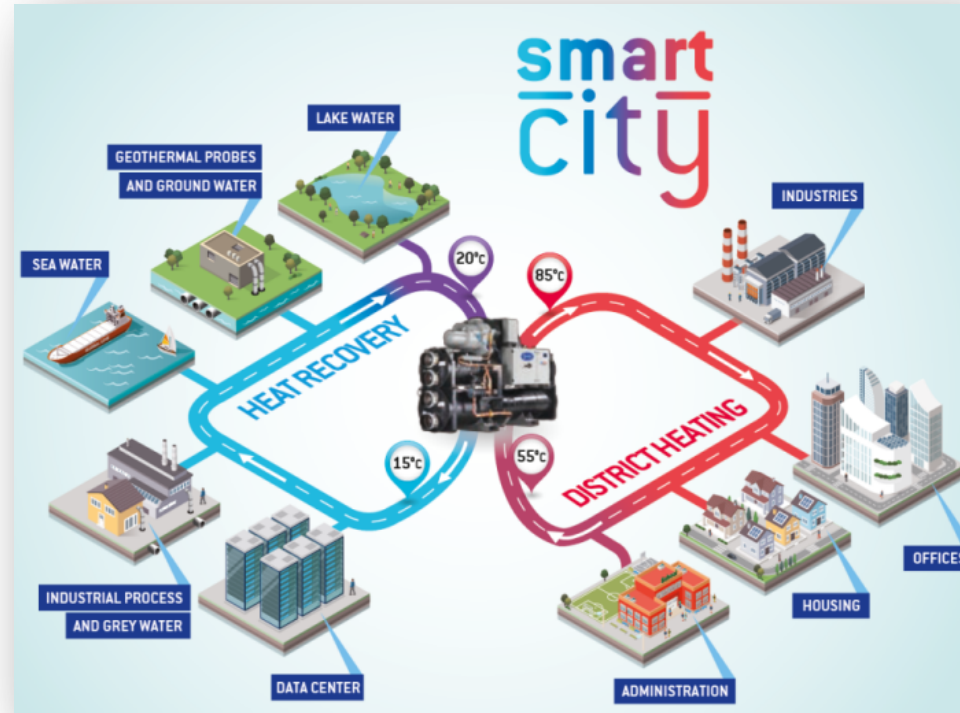
Repurposing Data Center heat for District Heating

1

Heat Recovery - provides great savings

2

Data Centre Heat Generation – Recovered & recycled not lost to atmosphere



3

Heat pumps – can use waste heat sources of low temperatures (below 45°C) in the district heating grid, minimising heat losses.

4

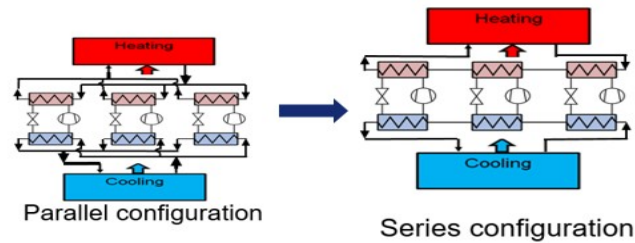
Neighbourhood Benefits – Data Centre heat recovery units to support heat networks

Our heat pump High Temperature 61XWH-ZE is the perfect solution to benefit from the heat rejected by data centers with more than 20 projects delivered and operational

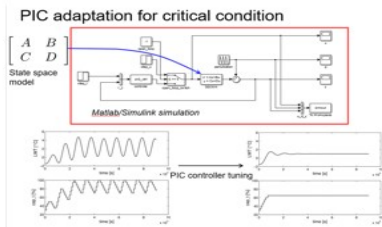
4 components which make solution unique

AQUAFORCE® PURETEC™
 High temperature heat pump using HFO refrigerant (R1234ze) with GWP<10HFO

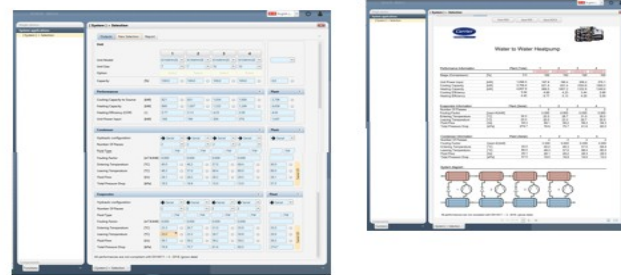
High temperature heat pump



Advanced system architecture (series configuration of up to 6 units resulting up to 25 % efficiency improvement)



Advanced system controls (PSM+) to allow optimum and stable operation of complex architectures



Configuration tools allowing quick and accurate system configurations

- High temperature
- Flexibility
- Modularity
- GWP <10 refrigerant
- Efficiency
- Advanced system architecture and controls



Data center waste energy recovery used to heat 3,000 homes in Genève and help achieve up to

80%
sustainable energy goal

30XF-Z Free-Cooling Chiller by CARRIER

NEW



30% annual energy savings*
(Variable speed vs fixed speed)

1

2

3

4

Ultra low GWP HFO refrigerant

High chilled water temperature production 30°C / 20°C

Variable-speed driven screw compressors

100% Hydronic Free-Cooling, optional glycol free
Smart Free-Cooling™ (under development)

100% Fast capacity Recovery in less than 60s

Dual Power connection 400/230V

Smart Energy monitoring™ (Cooling & Power)

Power Factor 0.98

Harmonics Electronic Filter

30XF-Z specifically designed for Green Data Centers

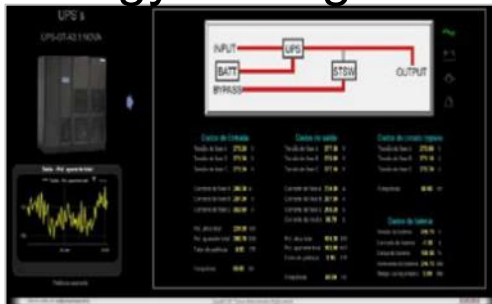
Picture illustrated Carrier 30XF-Z with Free-Cooling
30XF-Z features 100% Free-Cooling with V coil condenser design.
Sizes: 300 - 1800 kW

CONFIDENTIAL

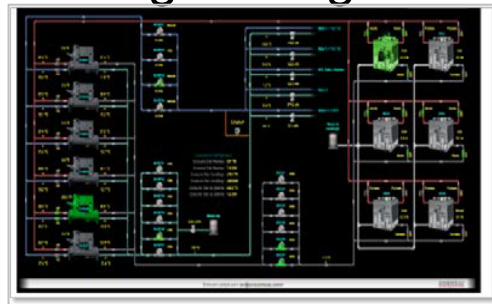


Integrated Data Center Management

Energy Management



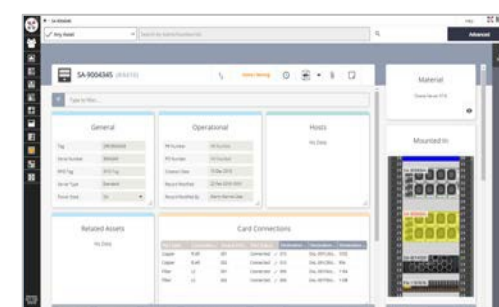
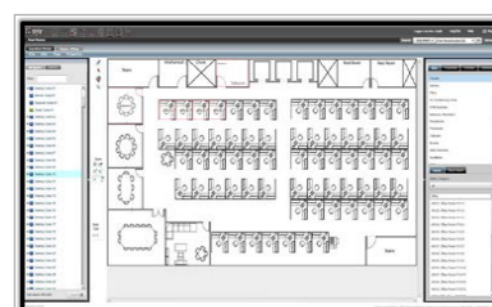
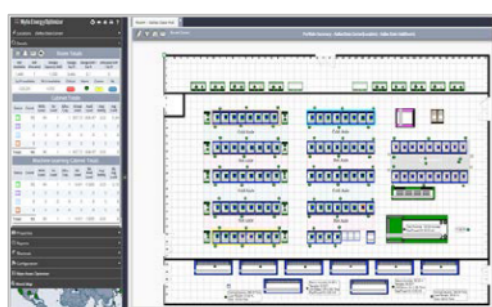
Cooling Management



Capacity Management



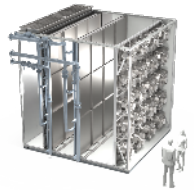
Asset Management



Nlyte IDCM Introduces an End-to-End Cooling Chain Management
Essential Functionality for Availability, Management and Sustainability

Carrier is uniquely positioned to deliver on sustainability

Carrier DC HVAC Products



Fan Wall AHUs

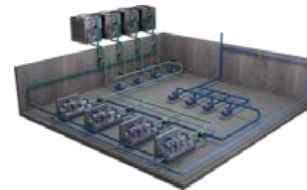
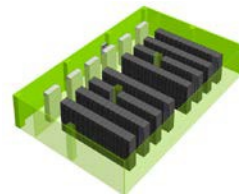


High-Efficiency Chillers



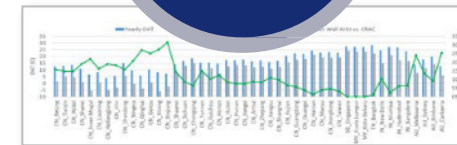
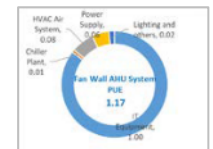
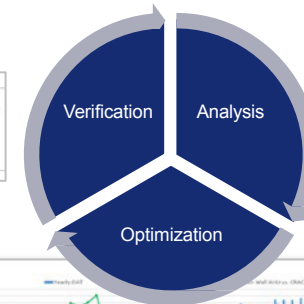
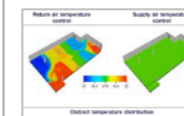
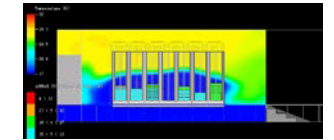
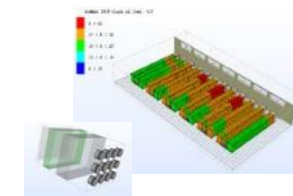
Advanced Controls

DC HVAC System Design



- High Efficiency Chiller Plant Design
- High Efficiency Chiller Plant Control
- Air System Free Cooling

Advanced HVAC Solution



- IT Rack Cooling Effectiveness Verification
- Air System Design Optimization
- PUE & WUE optimization
- Carbon Emission Reduction

Carrier HVAC Europe

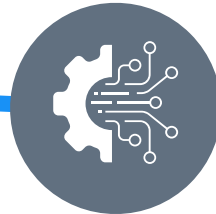


BLUEDGE



Partner with us

to get the best product solution that respects all your issues



Take advantage of
the widest selection of solutions
on the market



Choose efficiency
in total confidence





Thank you