

NEW Decade = NEW Challenges

~~CAPEX~~ vs. OPEX vs. Availability

STULZ

CLIMATE. CUSTOMIZED.



Robert Turkeš

Head of Sales Europe and CIS

STULZ GmbH – Germany

45 years

married, 3 kids

- Master electrical engineering
- since 1999 at STULZ and in the DC Industry

Mail: turkes@stulz.de

Phone: +49 40 5585 527

Mobile: +49 163 859 2937

The STULZ logo is located in the top right corner of the slide. It consists of the word "STULZ" in a bold, white, sans-serif font, centered within a red rectangular box. The box has a thin white border at the top and bottom.

Stulz Nordics AB

Sweden, Finland, Norway, Denmark

STULZ

CLIMATE. CUSTOMIZED.



Stulz Nordics AB

Based in Stockholm

- Pre sales
 - Design assistance
 - Aftersales support
 - Commissioning
 - Service support
 - Data Center optimisation
-



25 years difference

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Every Decade had it's challenges

90's

- Start of the CoLo market
- Massive grow of Data centres, huge investments
- Manufacture were not prepared for the run
- Dot-com crises

In Focus

Availability - CAPEX

Out of Focus

OPEX



Every Decade had it's challenges

STULZ

00's

Recovering from the crises

Optimising / recycling of the fast deployed Data Centers form the 90's

In Focus

CAPEX - OPEX

Out of Focus

Availability



Every Decade had it's challenges



10's

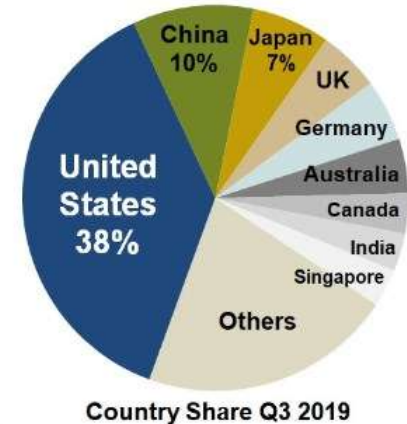
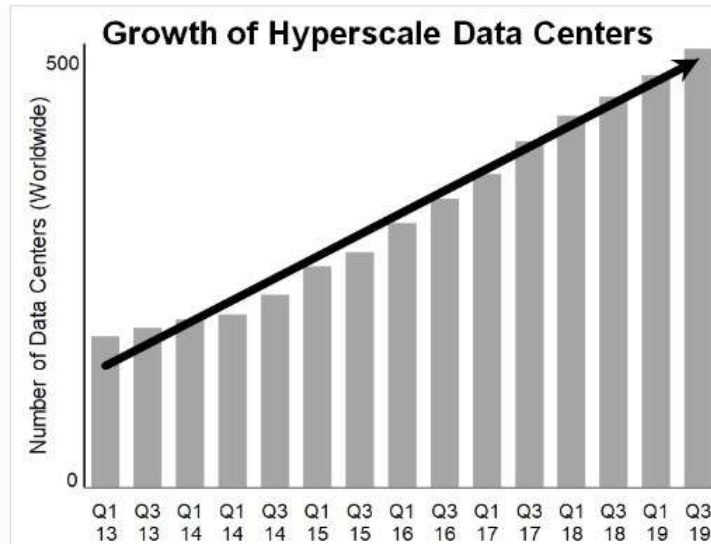
Growing CoLo and Hyper Scale market
Unstoppable Digitalization

In Focus

CAPEX – OPEX (TCO)

Out of Focus

Availability



Source: Synergy Research Group

Every Decade ~~had~~ has it's challenges

20's

- COVID-19 crises
- Extended demand for digital services
- broken supply chains
- War in Ukraine

In Focus

Availability - OPEX

Out of Focus

CAPEX



Ways out of the 20's challenges

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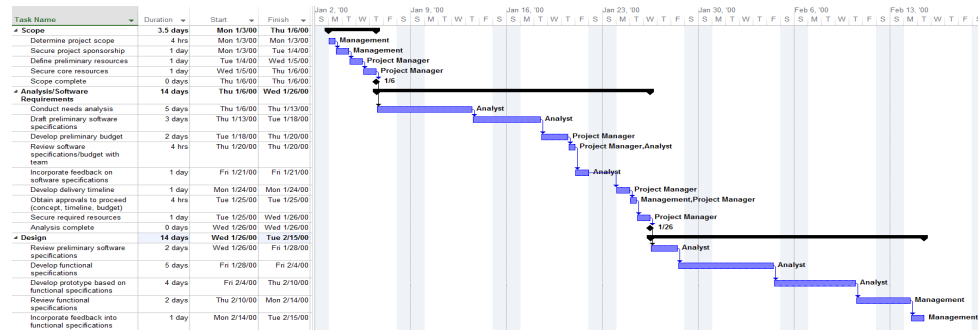


Ways out of the 20's challenges

Availability

Planning horizon

- High demand
- Broken supply chains
- Long lead times across the industry with unknown development.
- Early planning and reserve



Ways out of the 20's challenges

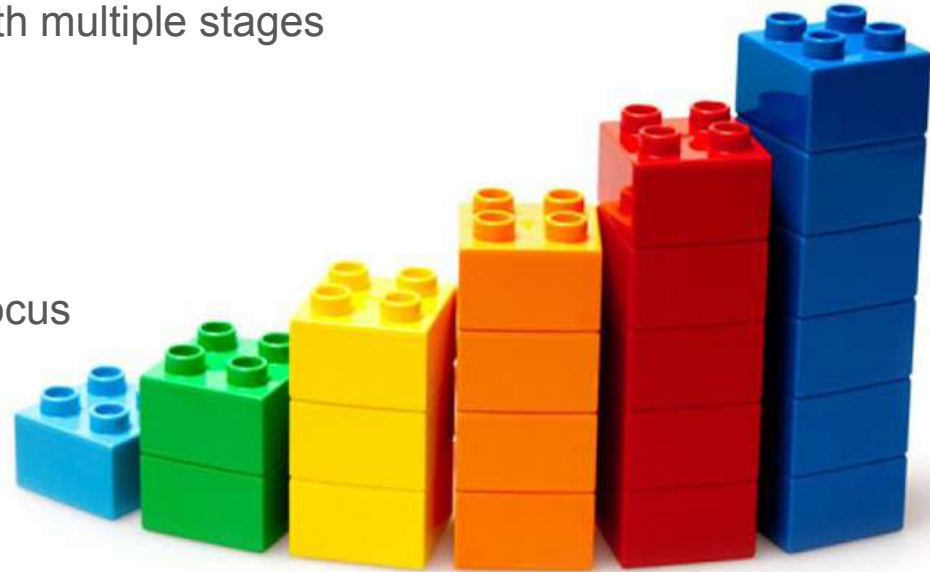
Availability

Scalability

- Scalable systems are helping in Projects with multiple stages
- build on demand - build as you grow

Reduce complexity

- If availability or time to market is the main focus
- Less components inverters etc.



Ways out of the 20's challenges

OPEX

Securing / producing “cheap” energy

Reduce OPEX

- Lowering the power consumption
- use of energy efficient equipment
- use of free cooling
- Changing the design conditions
- scaling
- energy re-use (heat recovery)



An iceberg floating in the ocean. The visible tip is small and jagged, while the submerged part is much larger and more complex. The sky is blue with scattered white clouds.

Slide from 2021

Every customer has it's own definition what minimum **cost** means



CAPEX

OPEX

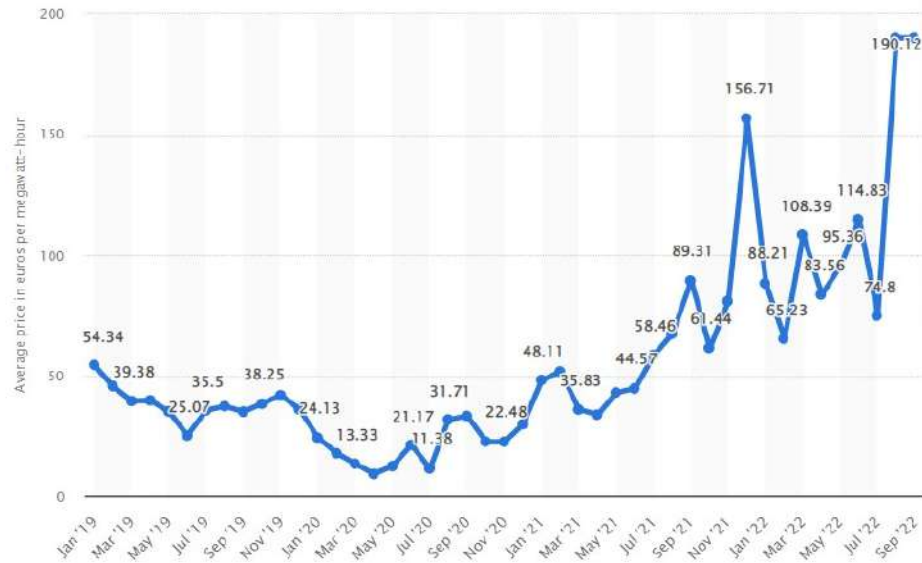
- Equipment
- Installation
- Planning
- Changing of the planning 😊

- Energy cost
- Maintenance cost
- Legally required inspections
- Repairs
- Spare parts

Slide from 2021

Average monthly electricity wholesale price in Sweden from January 2019 to September 2022

(in euros per megawatt-hour)



[Additional Information](#)

© Statista 2022

[Show source](#)

France: 1-Year forward baseload power (€ / Mwh)

French power prices are soaring

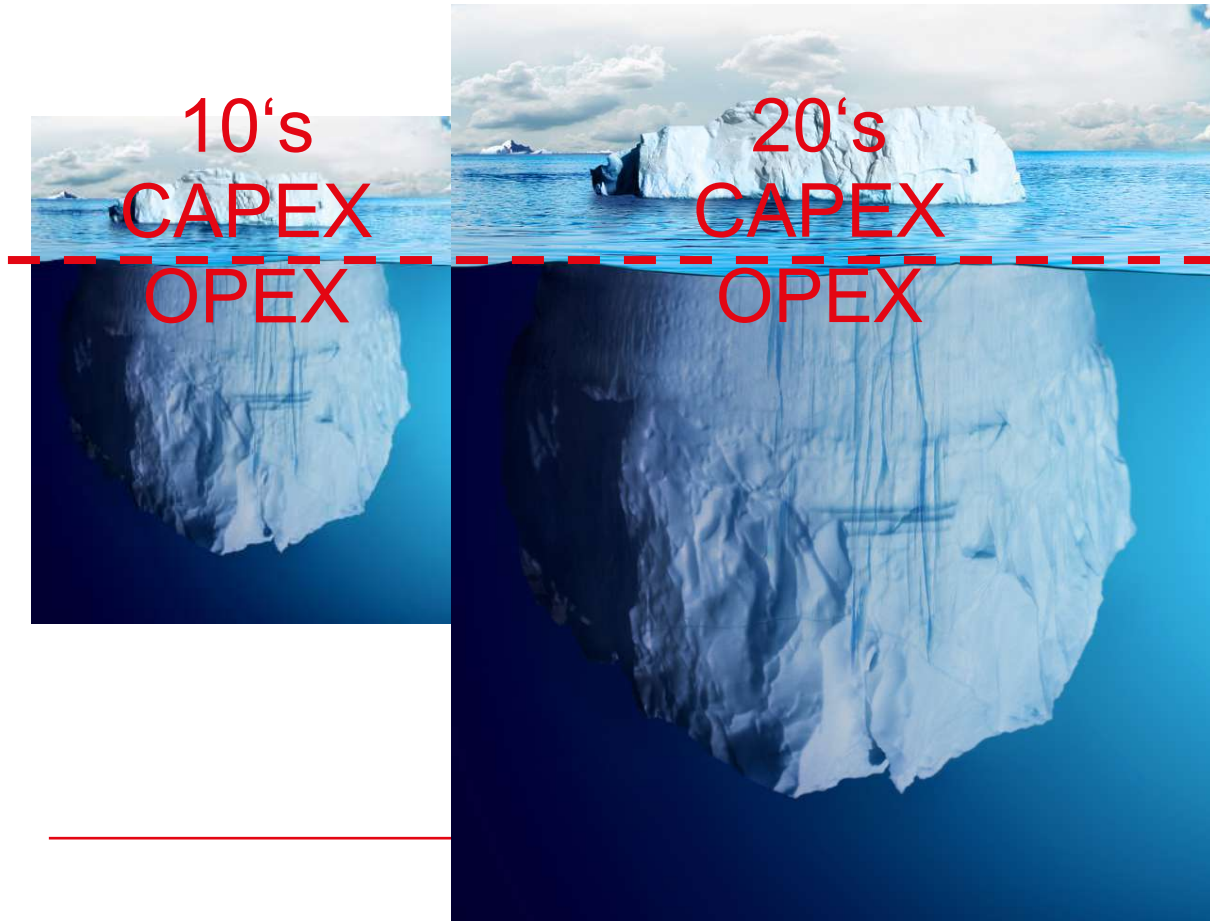
1-year forward baseload power (€ per Mwh)



Source: Refinitiv

© FT

Changes in less than 1 year....



Energy cost get out of control

Future development is unpredictable

Heat recovery

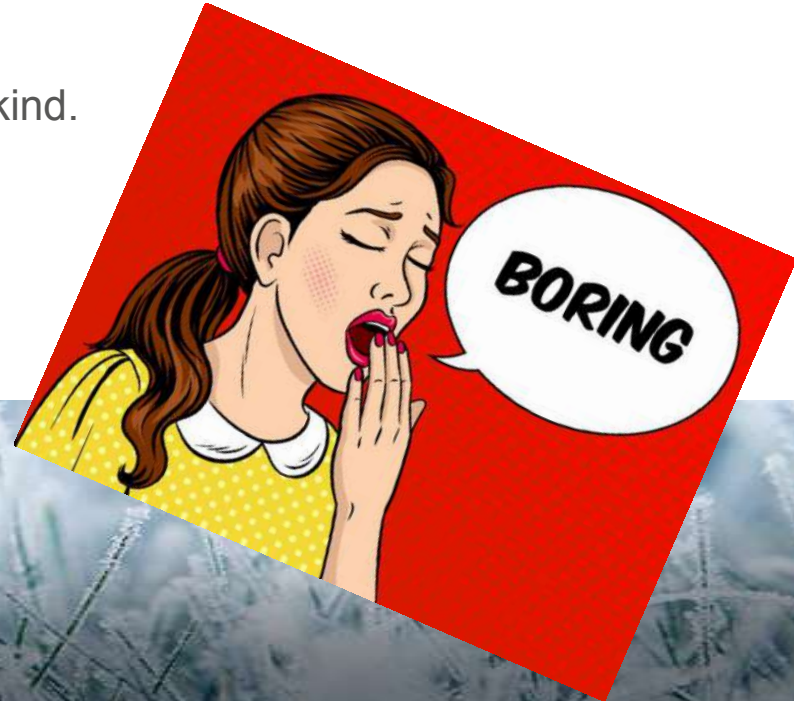
- Perfect option to re-use produced power a 2nd time.
- Very good infrastructure in the Nordics
- Stulz have various solutions to be used in heat recovery systems
- Very depending on the location and the demand.



Free Cooling

STULZ

- Using cold ambient temperature to reduce / eliminate the operation of mechanical cooling.
- Long free cooling periods in Nordic country
- Stulz is world leading in Free cooling systems of all kind.



Free Cooling Effect

STULZ



vs.



Free Cooling Effect

DX-System

compared to

Indirect Free cooling system (GE System)

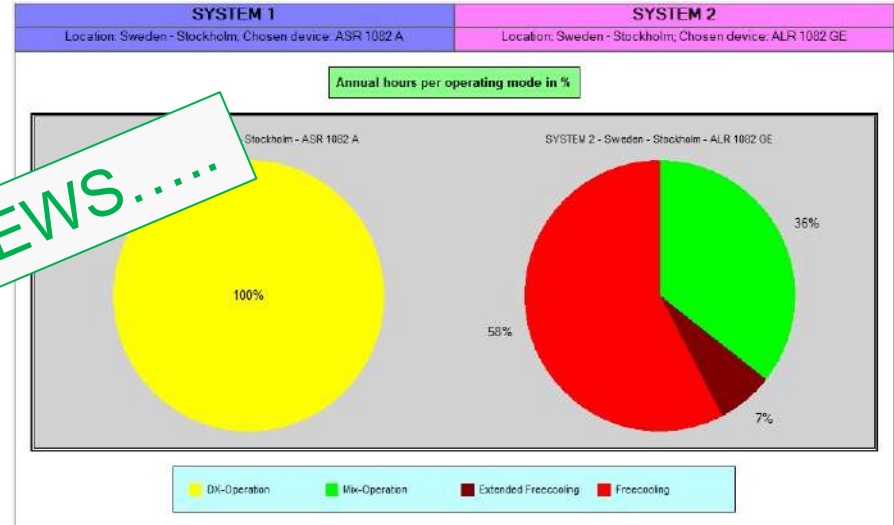
Conditions:

heat load:	1.000 kW
return air conditions:	33°C / 30%r.H.
location:	Stockholm
price per kW/h:	0,10 €
Annual increase energy cost :	3%

Free Cooling Effect

Operating and Total costs		Total	Total
Operating costs per year	EUR	242.467	94.034
Total costs after 1 year	EUR	1.014.207	588.412
after 2 years	EUR	1.263.948	685.267
after 3 years	EUR	1.521.181	785.028
after 4 years	EUR	1.786.131	
after 5 years	EUR	2.059.030	
after 6 years	EUR	2.340.111	1.102.628
after 7 years	EUR	2.629.634	1.214.910
after 8 years	EUR	2.927.838	1.330.560
after 9 years	EUR	3.234.988	1.449.679
after 10 years	EUR	3.551.352	1.572.372

GOOD NEWS.....



Free cooling ≠ Free cooling

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Water 12/18°C →
MIX / FC ... **below 12°C**



Room Air 18/30°C →
MIX / FC ... **below 18°C**

Operation point

- Use the complete range of possibilities
- Temperature reference point
- Within the ASHRAE recommendations much more possibilities



OPEX Effect



Indirect Free cooling system (GE System)

heat load:
return air conditions:
location:

1.000 kW
33°C / 30%r.H.
Stockholm

price per kW/h:
Annual increase energy cost :

3% vs. 10% 0,10 € vs. 0,40 €

OPEX Effect

Annual increase energy costs:	%	3	10	
Capital interest:	%	0	0	
Period of depreciation:	Years	10	10	
Operating and Total costs		Total	Total	
Operating costs per year	EUR	94.034	5.137	282.103
Total costs after 1 year	EUR	587.288	9.515	282.103
after 2 years	EUR	1.124.910	1.284.266	588.999
after 3 years	EUR	1.607.781	1.739.392	954.364
after 4 years	EUR	2.030.628	2.240.030	1.352.249
after 5 years	EUR	2.393.617	2.790.732	1.797.115
after 6 years	EUR	2.706.628	3.396.504	2.293.876
after 7 years	EUR	2.970.679	4.062.854	2.847.944
after 8 years	EUR	3.185.780	4.795.839	3.465.279
after 9 years	EUR	3.351.931	5.602.122	4.152.443
after 10 years	EUR	3.470.242	6.489.033	4.916.661

BAD NEWS.....

OPEX Effect

- Small optimisation can change the game.....

SYSTEM 1 (Blue) vs SYSTEM 2 (Pink)

Capacity: 1000 kW

Temperature: 36 °C

Power Consumption: 1042 kW (System 1) vs 1052 kW (System 2)

Annual increase energy costs:	%	10	10
Capital interest:	%	0	0
Period of depreciation:	Years	10	10

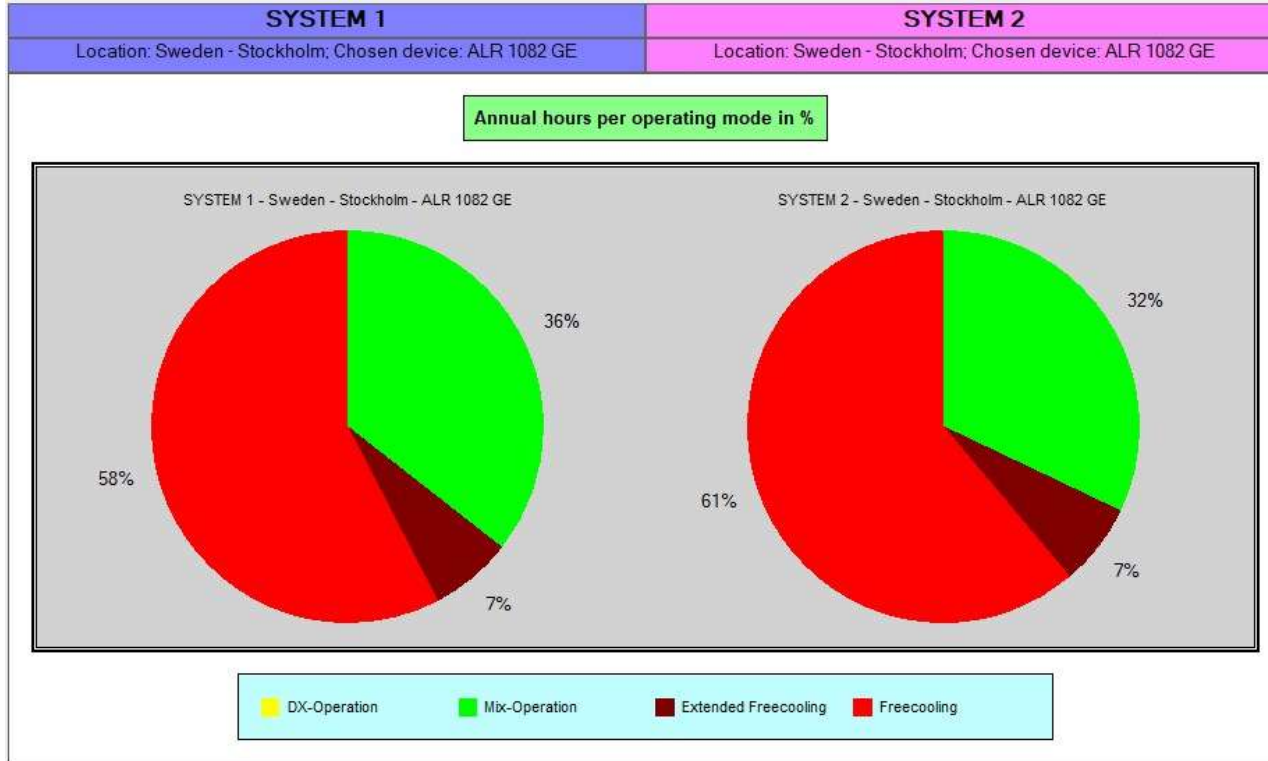
Operating and Total costs		Total	Total	
Operating costs per year	EUR	376.137	376.137	-44.948
Total costs after 1 year	EUR	870.000	870.000	-27.960
after 2 years	EUR	1.240.000	1.206.863	-77.403
after 3 years	EUR	1.610.000	1.607.602	-131.790
after 4 years	EUR	1.980.000	2.048.415	-191.615
after 5 years	EUR	2.350.000	2.533.309	-257.423
after 6 years	EUR	2.720.000	3.066.692	-329.812
after 7 years	EUR	3.090.000	3.653.414	-409.440
after 8 years	EUR	3.460.000	4.298.808	-497.031
after 9 years	EUR	3.830.000	5.008.741	-593.381
after 10 years	EUR	4.200.000	5.789.667	-699.366

GOOD NEWS.....

-22%

-700.000,- €
In 10 Years

OPEX Effect



OPEX Effect

STULZ

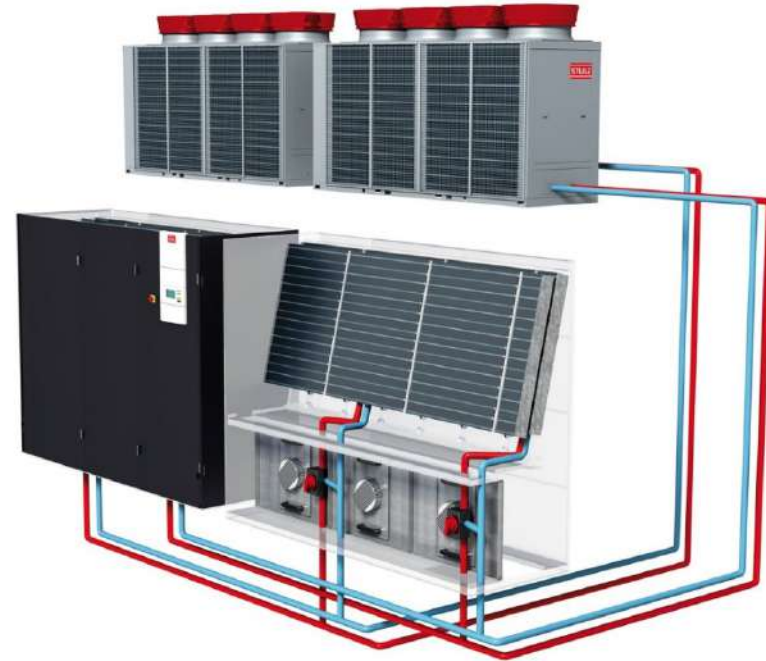
CW System water temp 7 / 12°C
compared to

CW System water temp 11 / 16°C

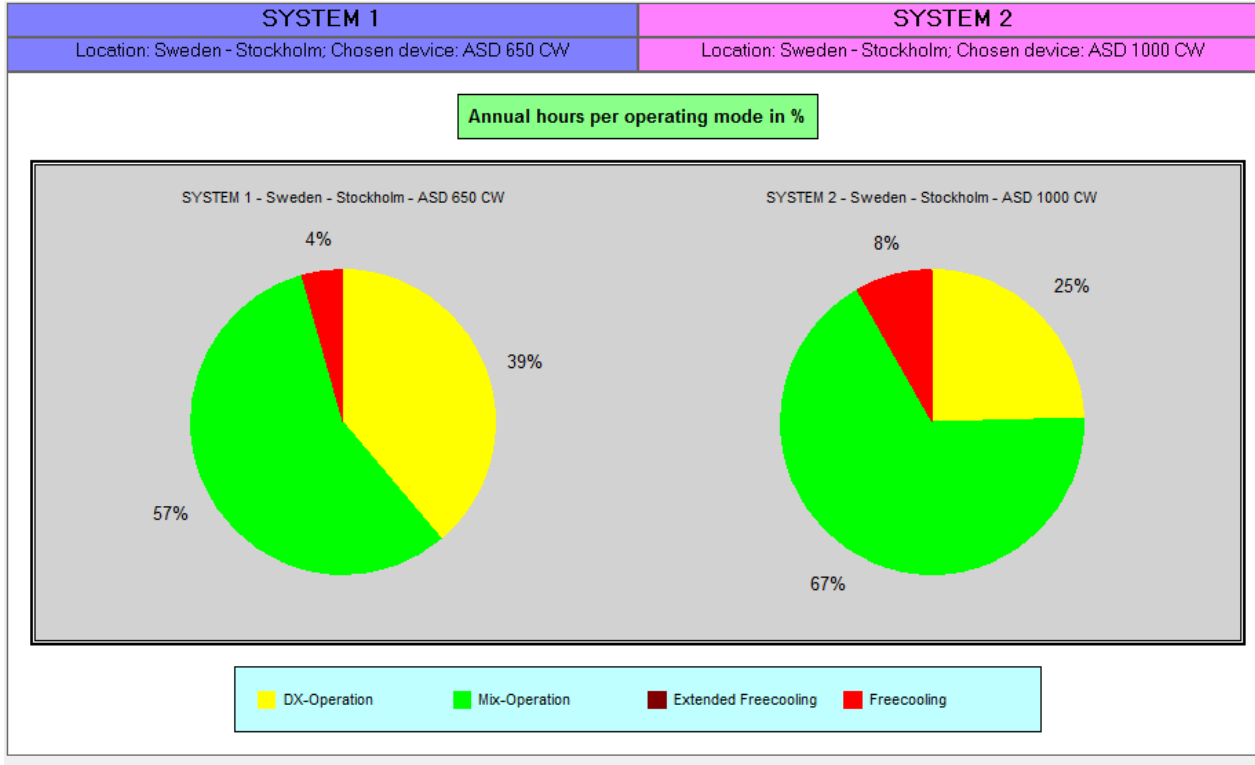
Conditions:
heat load:
return air conditions:
location:
price per kW/h:
Annual increase energy cost :

3%

1,000 kW
24°C / 50%r.H.
Stockholm
0,13 €



OPEX Effect



Visibility and information is the key

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CyberHub ECO.DC

STULZ

#1 Cutting operation cost

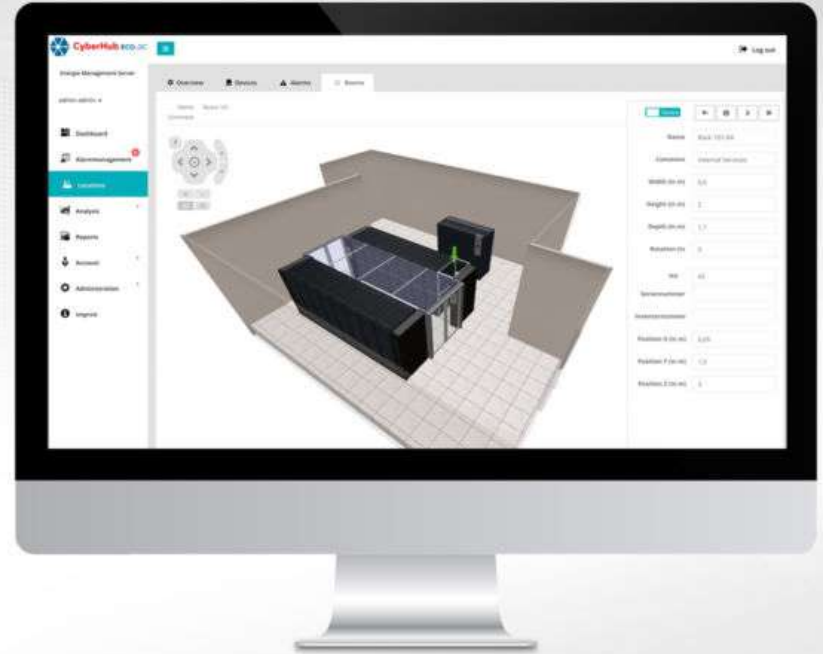
Precisely track down potential savings and implement them immediately.

#2 Reducing the impact of unplanned downtime

Round the clock monitoring

#3 Ensuring quick response time to external influences or defects

Collect measurement data from all energy consumers, and collectively analyse them for the entire data center.



Global & Local know-how

The logo for STULZ, consisting of the word "STULZ" in white, uppercase letters on a red rectangular background.

- Global Production plants
 - reduced shipping, local / redundant supply chains
 - Stulz KAM Team
 - global coordination, customer specific requirements
 - Stulz Cloud application team
 - Cooling concepts, special designs
 - Business unit chiller
 - Chiller / hydraulic concepts
 - Stulz network 11/22/140
 - worldwide country specific knowledge
 - Service
 - worldwide factory certified technicians
-

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THE WHOLE RANGE OF COOLING. FROM ONE SINGLE SOURCE.

Thank you for your attention

STULZ

