



# ATMO sphere





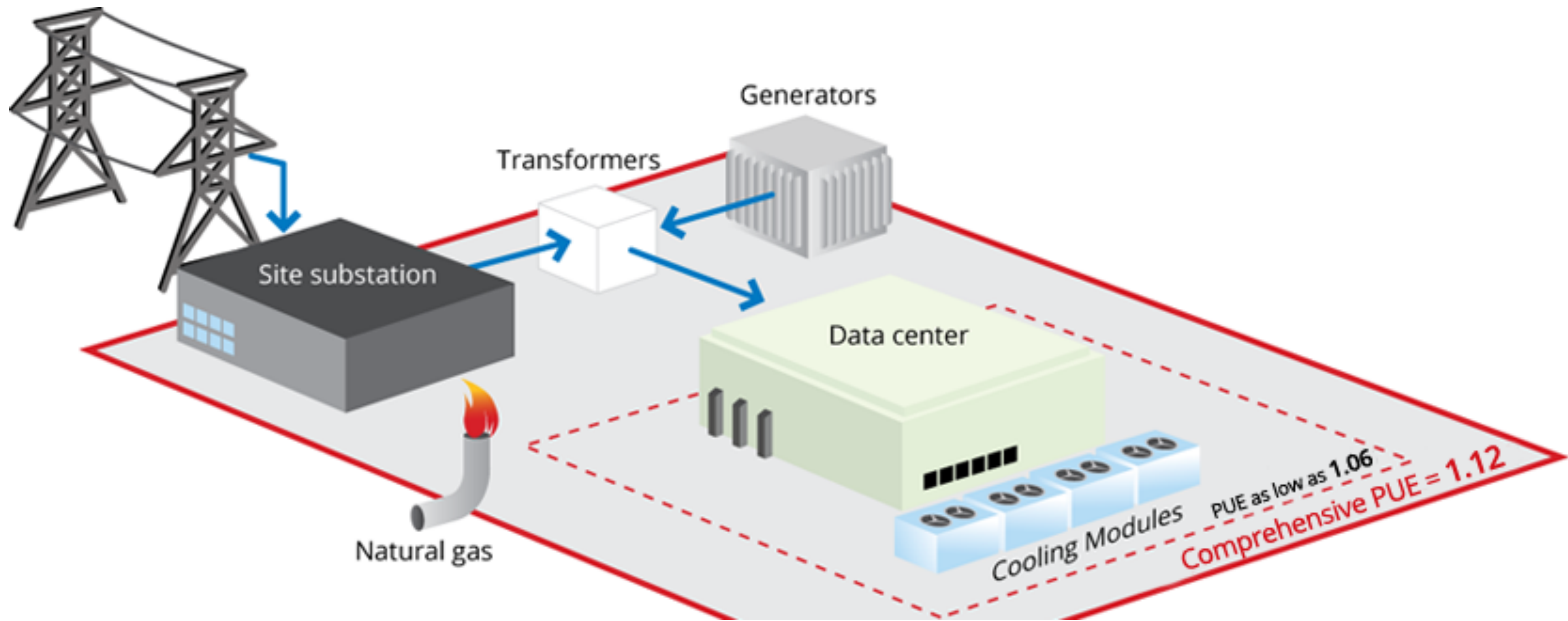
## **Natural Refrigerants in Data Centres**

NatRefs - Lessons learned from the German-speaking market

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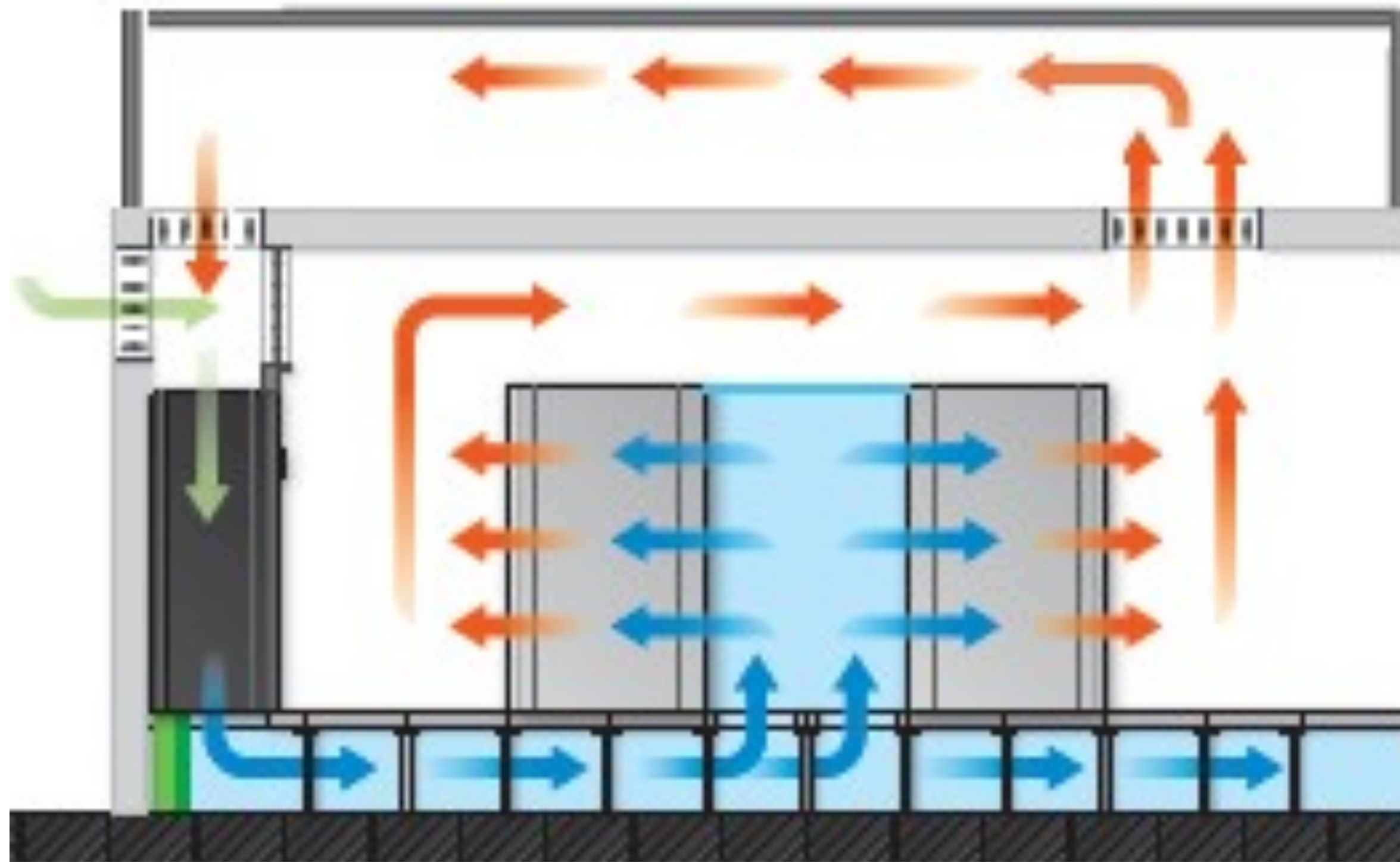


## Increasing requirements regarding Power Usage Effectiveness (PUE) and Data Center Infrastructure Efficiency (DCiE)





**Pure free cooling, heat recovery or adsorption are not in scope of this talk...**





## Worldwide refrigerant regulations and strong trends to use natural refrigerates

- Data centers are no exception to the regulatory trends and, while the issues are quite clear, the solutions are far less so.
- NWF chillers are available from a large number of manufacturers, but their application for data center cooling is still rather limited
- Main Barriers for the application in data centers:
  - Cooling is a needed pain, lack of focus
  - Rather apply approved technology
  - Refrigerant risks (flammability & toxicity)

R729  
R744 R1270  
R717 R290  
R718 R600a



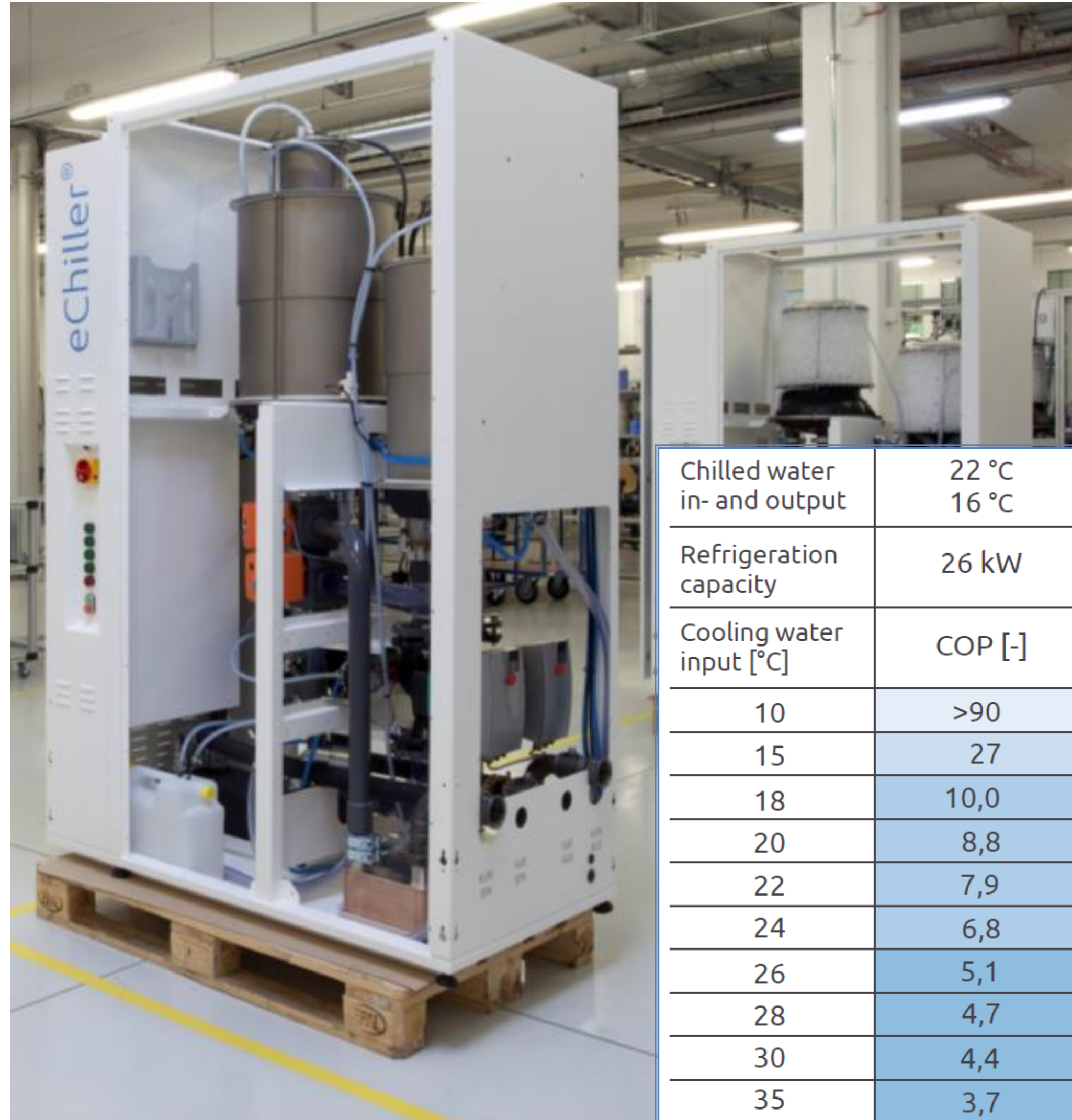
**Water - R718**





## The eChiller

- Since 2014 more than 360 months of operation experience with 80 % data center applications
- Over 380.000 € total electricity cost savings @ 0,2 €/kWh or over 1.120 t CO<sub>2</sub>-equivalent savings @ 580 gCO<sub>2</sub>/kWh (baseline: air cooled A/C unit with COP 4)
- Typical project: test one machines for a year, get convinced, buy one more, expended testing, further steps
- Generally very positive feed back from customers and operators, but it is a very time consuming process...
- Main barriers:
  - We are an unknown, rather small supplier
  - Uncertain investor or owner structure
  - Poor track record of earlier market entry attempts
  - eChiller unit ref. capacity limited to 35 kW
  - Indoor installation (no frost) required
  - Competition with mayor market players



Chilled water in- and output	22 °C 16 °C	24 °C 18 °C	26 °C 20 °C	28 °C 22 °C
Refrigeration capacity	26 kW	30 kW	33 kW	35 kW
Cooling water input [°C]	COP [-]	COP [-]	COP [-]	COP [-]
10	>90	>100	>110	>120
15	27	30	110	120
18	10,0	18	23	120
20	8,8	9,7	15	40
22	7,9	8,2	10	20
24	6,8	7,0	9,0	10
26	5,1	6,3	7,8	9,0
28	4,7	6,3	6,6	7,9
30	4,4	4,5	5,0	6,1
35	3,7	3,7	4,3	5,0
40	3,0	3,2	3,5	3,6
45				3,1
	Stage II	Stage I	Free Cooling+	Free Cooling





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sphere

**Thank you very much!**

