Datacenter Sustainability – How?

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Sustainability and efficiency metrics for data centers

Datacenter Forum

Stockholm 24th of November

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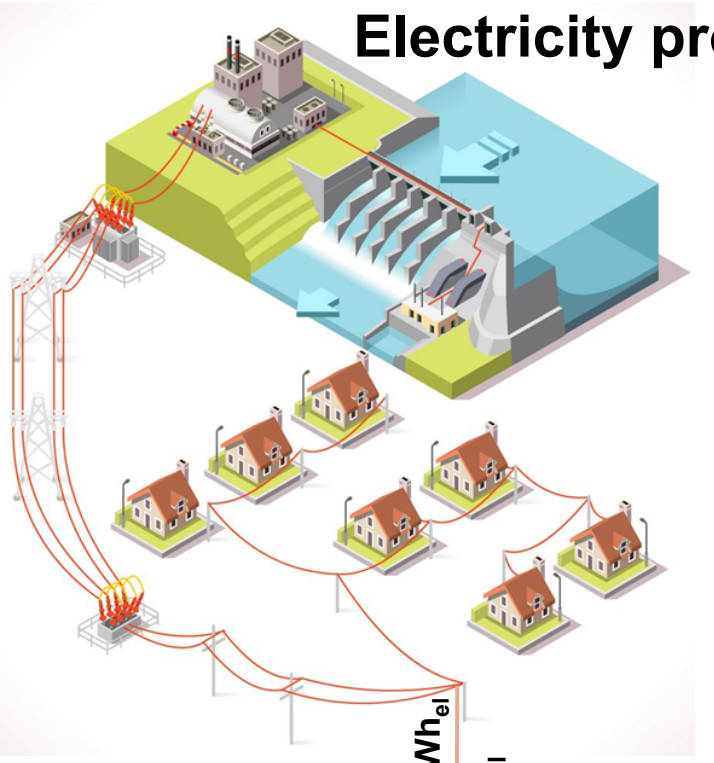
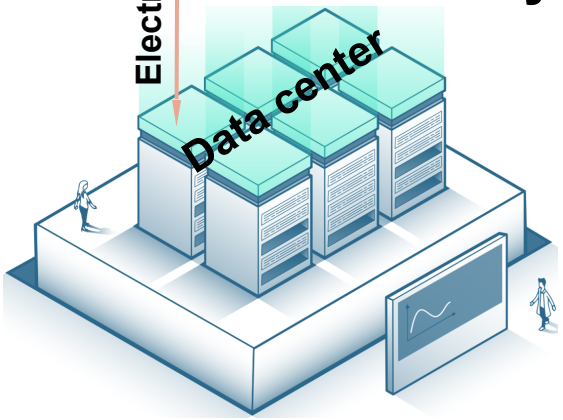
Electricity production



Electricity supply, kWh_{el}

$kgCO_2/kWh_{el}$

Electricity use

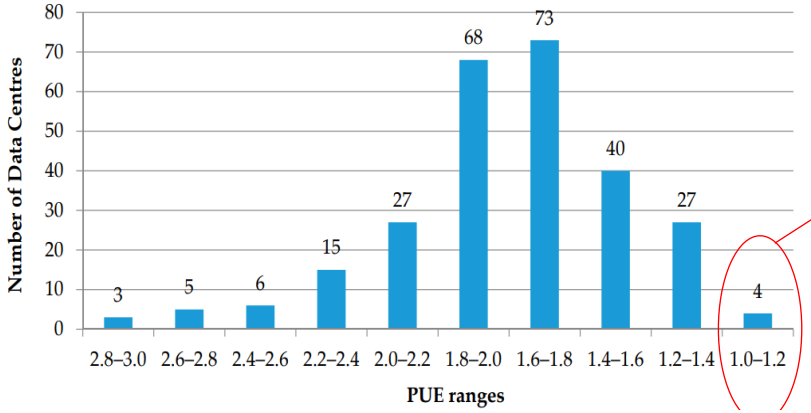


Best-case scenario

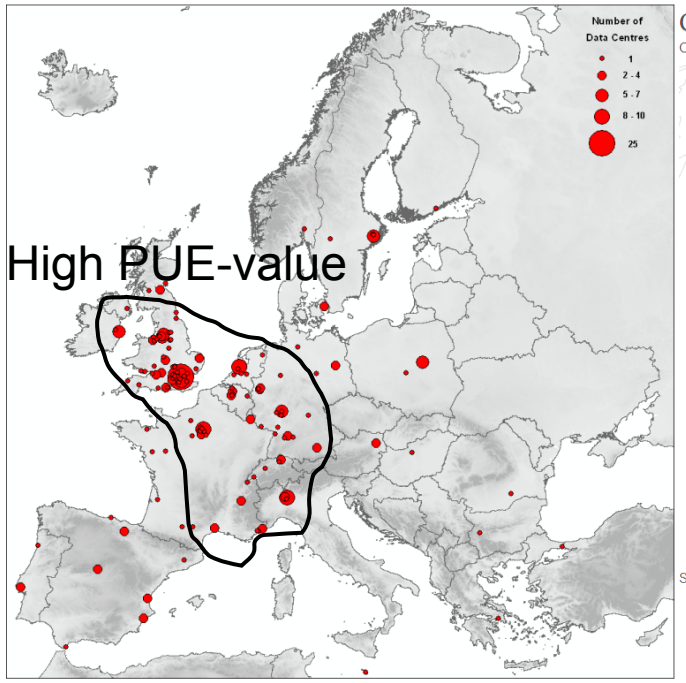
All electricity supplied to data center is used for computing

In theory: Power Usage Effectiveness (PUE)= 1

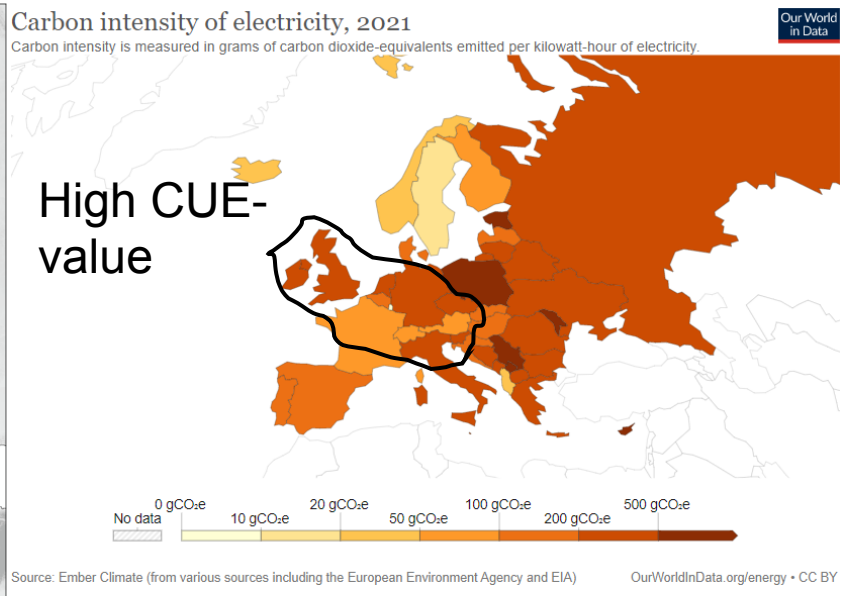
In reality:



Some of best PUE-values in Northern Europe



High PUE-value



High CUE-value

Figure 1. Geographical distribution of the data centres participating in the Code of Conduct (CoC).

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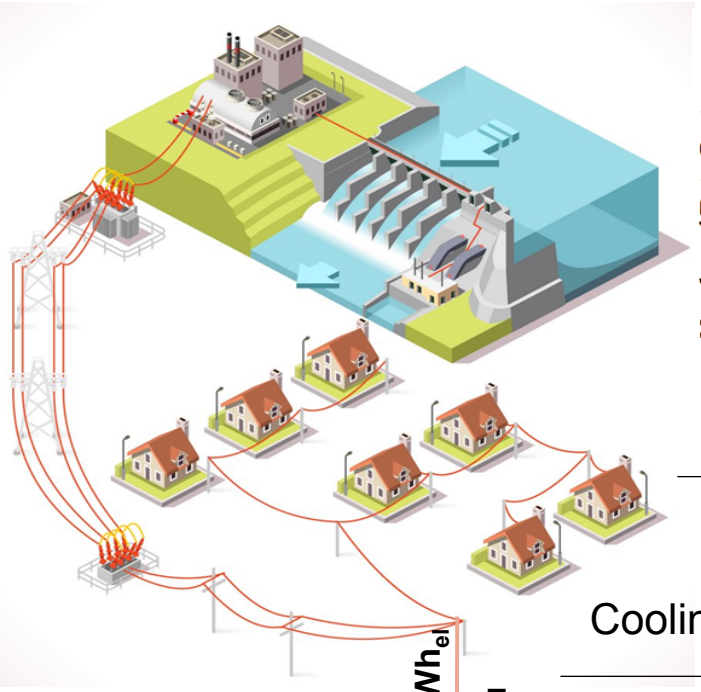
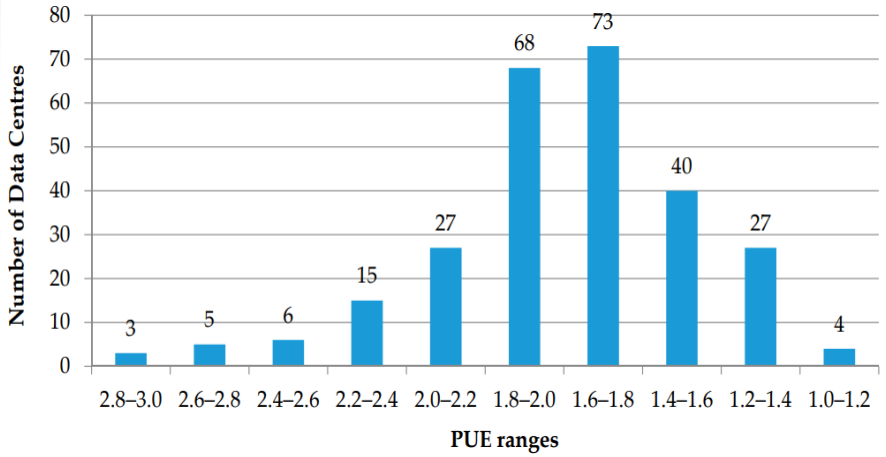
Electricity production



Electricity supply, kWh_{el}

$kgCO_2/kWh_{el}$

Alternative 1



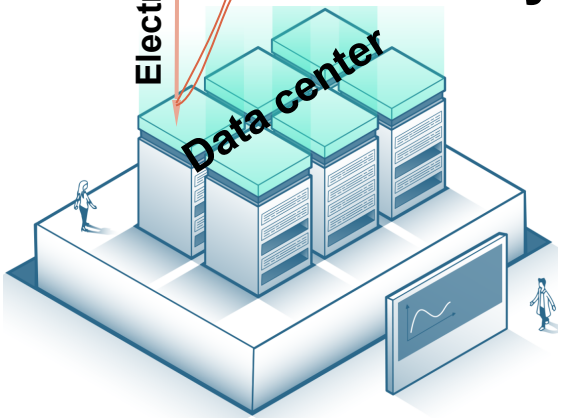
PUE > 1 requires cooling

Cooling has potential to additionally increase PUE-value

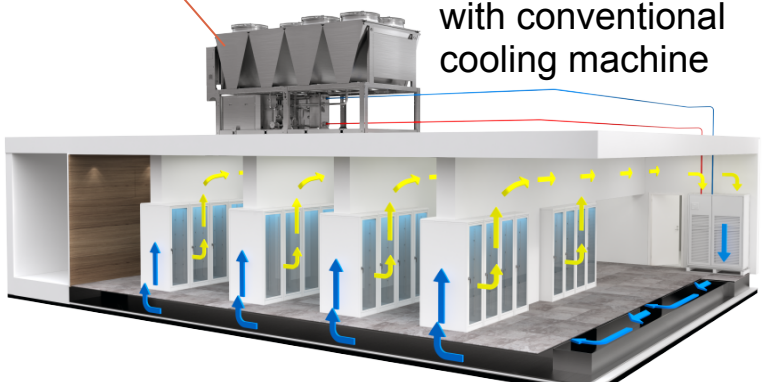
Requires electricity to operate (compression cycle), kWh_{el}

Additional electricity use for cooling, kWh_{el}

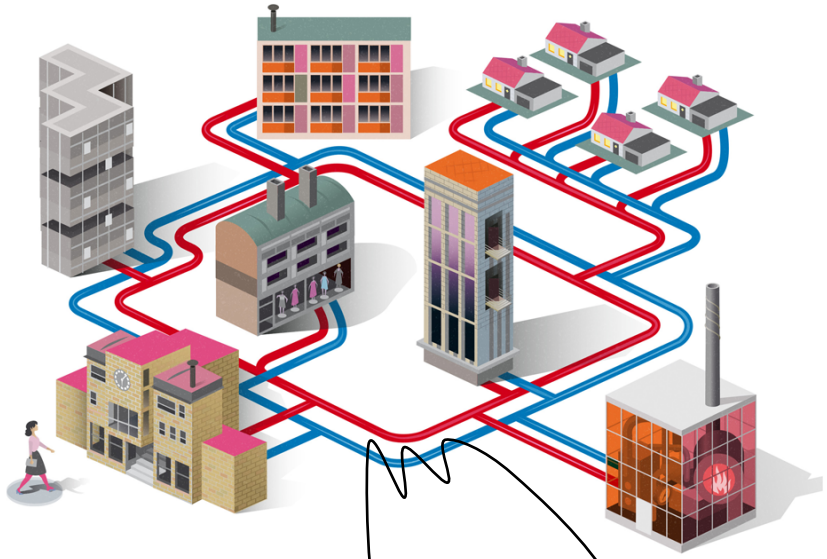
Electricity use



Hydronic (water-based) cooling with conventional cooling machine



Alternative 2

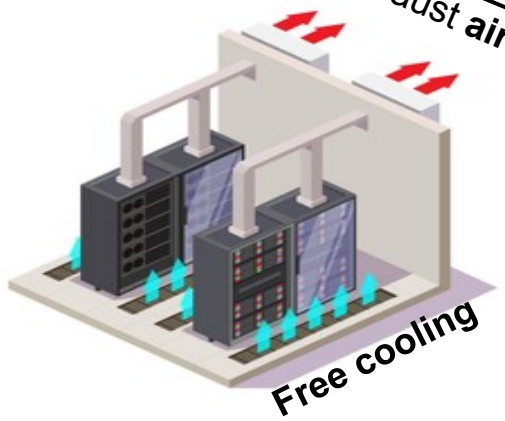


Water ≈ 25-30 °C

Water 35-40 °C

Exhaust-air heat pump

Exhaust **air** 25 °C



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What should be do?

How should we approach this complexity?

1. Location of Data Center facility
2. High Efficient IT servers should be installed in data centers
3. Electricity supply with low CO2-footprint should be used
4. Air-to-air heat recovery should be prioritized
5. Heat recovery with electric-driven heat pumps should be considered
6. Pressure losses of air and hydronic distribution networks need to be reduced to minimum
7. High efficient lighting, fans and pumps need to be used
8. Necessary cooling supply should come from renewable energy, such as free cooling, district cooling, snow cooling, geothermal cooling etc..

We bring buildings to life.

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