

Wooden Data Center

Sustainable Data Centers for the planet



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Startup
Program

Demystifying Data Centers

Windclouds und Colocation.Green



2015 - 2019



windcloud

2018 -



2019 - 2021 DE

2021 - DK



Open Commitment

Embracing 4 Opens

“Humanity faces unseen transformations until 2050, only by Open Innovation and Open Collaporation, accelerated by Opensource Software and Hardware, monitored by Open Data, we shall overcome them.”

the sole inventor and operator of the internet 2023

Sustainable Data Center Blueprint

The Goal



How to measure carbon emissions, communicated through the medium of hot beverages



Scope 1

Emissions from burning fossil fuels to make hot coffee



Scope 2

Emissions from electricity generated on your behalf, to make coffee



Scope 3

Emissions from activity in your supply chain, so you can have coffee

How Carbon emissions Are Distributed in the Data Center

Greenhous Gas Emissions

Scope 1 direct emissions	Scope 2 indirect emissions	Scope 3 supply chain emission
Backup Generators Onsite Generation	Energy consumption (Server, Auxiliary) Any efficiency measure, Like PUE Heat-reuse Pitfalls	Server Deployment Data Center Construction Availability classes Product Lifecycles

META = 0,5%

0,5%

99%

Global= 1%

17%

82%

Why

Transition to a net-zero economic system



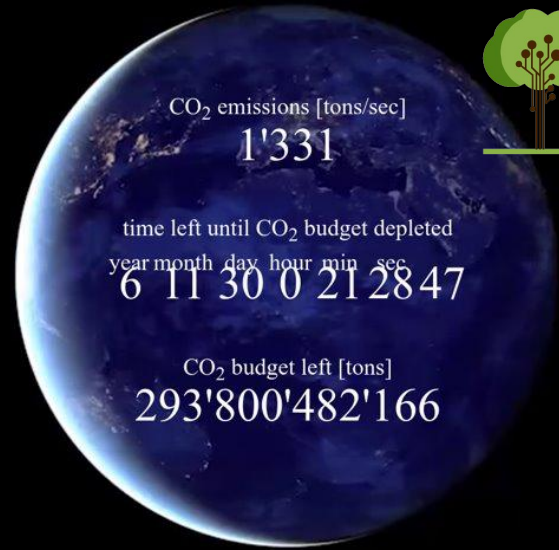
Meta



Microsoft



Google



Scope 1 Emissions - solved

Greenhouse Gas Emissions

- 90% CO2 reduction
- Runs with your Generator
- Does not age for 10 years
- Does not clock your fuelfilter

Scale enables innovation!

H2, BESS, SMR

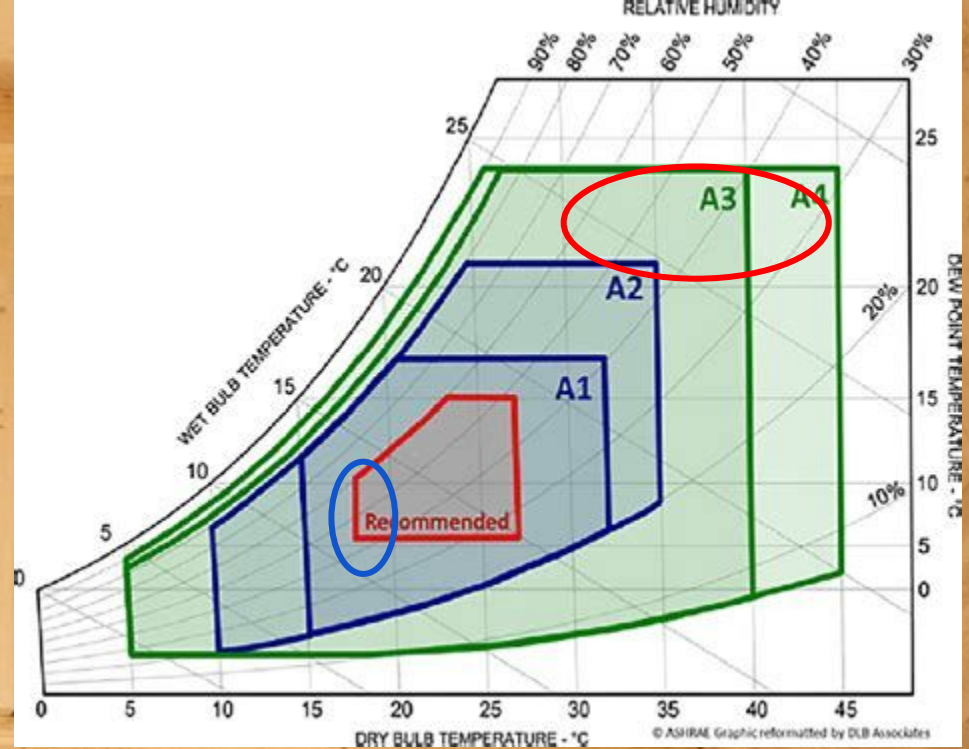
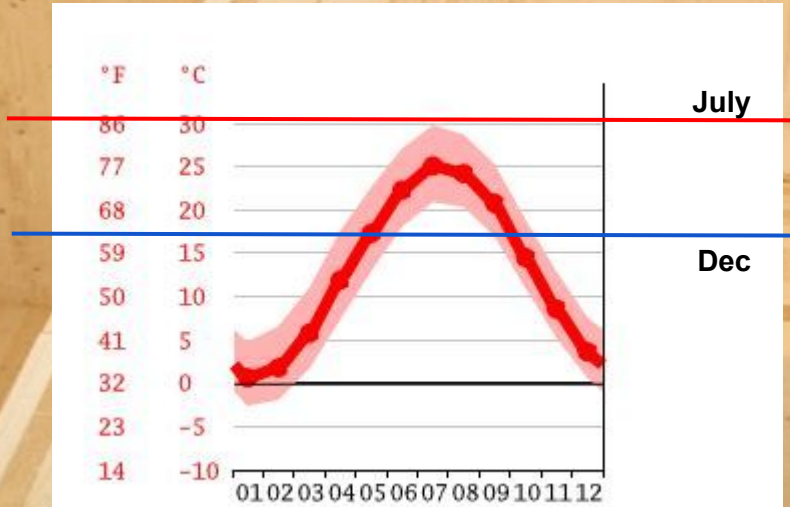


Scope 2 Emissions - solved

Energy consumption Server - temperature

- Run it hot,....

....When needed.



Scope 2 Emissions - solved

Energy consumption Server

- use efficient CPU's
- Use efficient Servers OCP
- Use efficient Air Cooling
- Use Liquid Cooling
- Re-use the Heat



Use Virtualisation and Cloud to increase Utilisation.



Scope 2 Emissions - solved

Energy consumption Server

- Liquid cooling Eliminates Fans upto 50 %
- DC energy eliminates PSU upto 35%
- Servers do not mind high temperature, you do.

Server Specs (35-45°C)(55°C)

Future Server, PCB with Networking and DC cables



Scope 2 Emissions - solved

Guideline

- Move to Water, where sensible
- Use Direct or indirect free cooling most of the year
- USE Physics
- Use High efficient, high temp UPS

Data Center move to high temperature, low PUE



Data center energy efficiency gains have flattened out



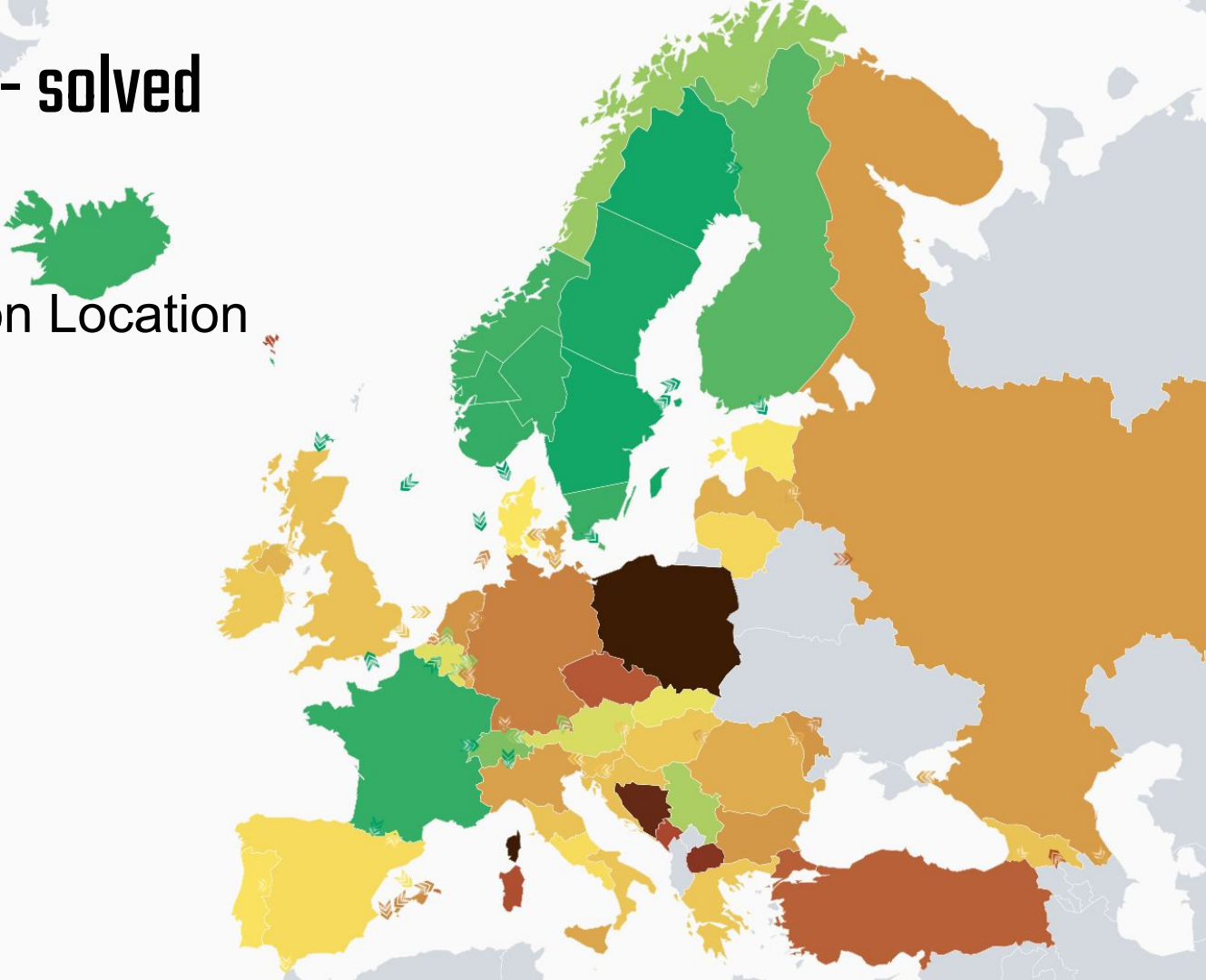
Source: Reported data center PUE figures in global Uptime Institute surveys from 2007 to 2020

Scope 2 Emissions - solved

Energy purchase

- Location, Location Location
-
-

Data Center move to green grids.



Scope 2 Emissions - solved

Energy purchase

- ...if you do not have Location
- Work with your energy provider to create an hour to hour proof to have used renewable energy
- If you use certificats, it must be true renewables!

Every Data Center uses “green” energy, most of it is green washing. (Germany) **Not Finland**

Scope 2 Emissions - supported

Energy creation

Create your own Wind and Solar capacity.

Grow your Data Centers where you can access renewable energy. (Probably not Frankfurt)

Creating your own energy is cheaper in a lot of grids, especially in Germany.



Scope 2 Emissions - solved

PUE considerations

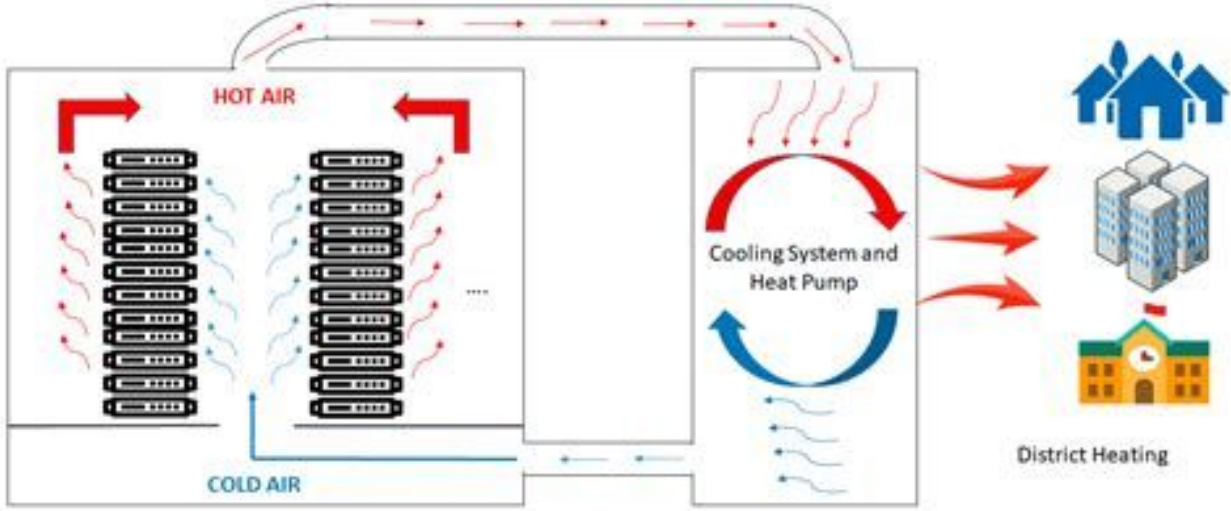
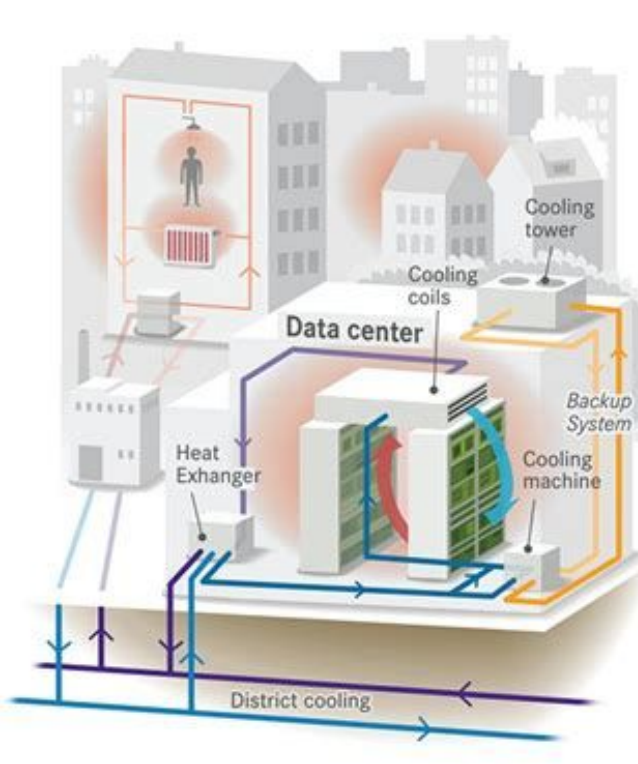
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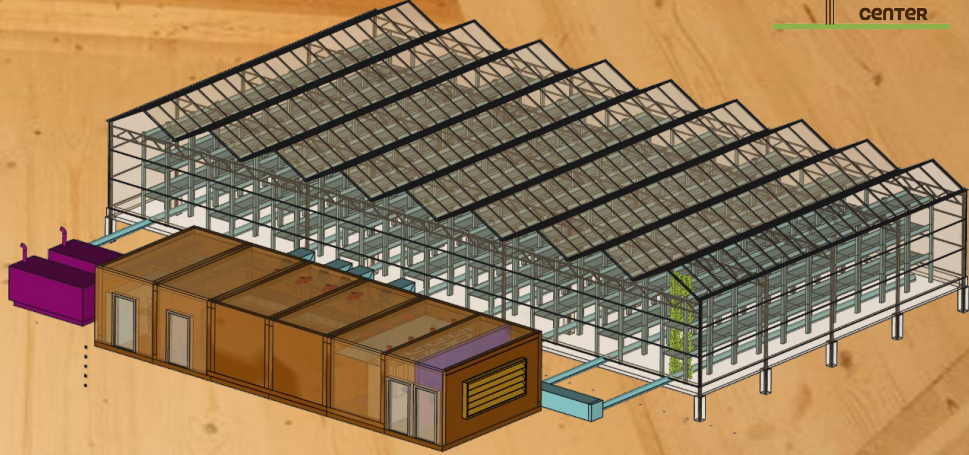
Scope 2 Emissions - solved

Heat reuse



Scope 2 Emissions - solved

Heat reuse



1232

How Carbon emissions Are Distributed in the Data Center

Greenhous Gas Emissions

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Backup Generators Onsite Generation	Energy consumption (Server, Auxiliary) Energy Purchase Renewable Onsite Creation Any efficiency measure, Like PUE Heat-reuse Pitfalls	Server Deployment Data Center Construction Availability classes Product Lifecycles


Scope 3 Emissions - under construction

Use your hardware longer



Microsoft extends life of cloud servers from four to six years

Banks billions by making gear last even longer than AWS or Google

 [Simon Sharwood, APAC Editor](#)

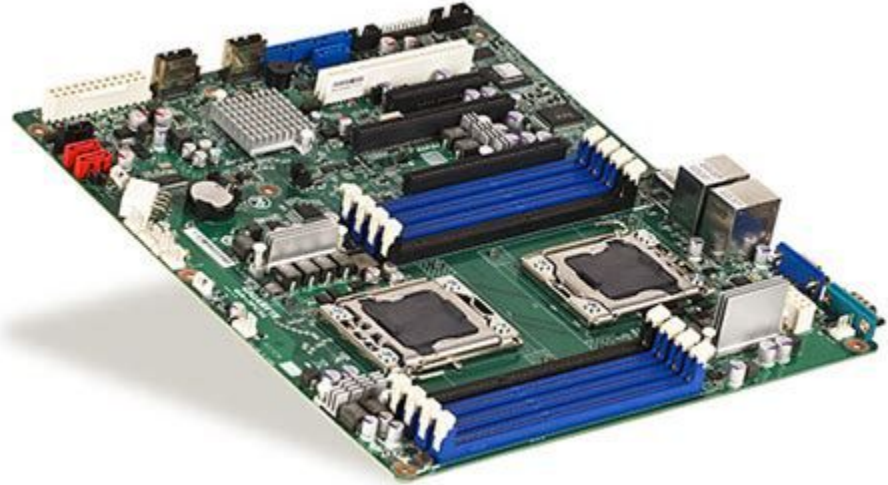
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Scope 3 Emissions - under construction

Reduce - Reuse - recycle



OCP Server now



Open Server in 202X

Scope 3 Emissions - under construction



Reduce - Reuse - recycle



Project Leads

Alexander Rakow, Mohan Kumar

Steering Committee Representative: [Eric Dahlen](#) (Intel)

Scope

Mission:

Data center industry is moving towards net carbon zero goals over coming decade. OCP Sustainability Project is working to enable progress towards industry goals by addressing unique challenges and opportunities presented within Open Compute Project ecosystem. The Sustainability project led the introduction of Sustainability as the 5th tenet into OCP. Leveraging the expertise of the OCP community, we offer an open framework and resources for OCP members and data center industry – vendors, suppliers, and end users - to deploy industry best practices that promotes reusability and circularity.

Scope 3 Emissions - under construction

Reduce - Reuse - recycle

We need to use different materials

Concrete & Steel account for 14% of the Global CO2

<https://www.materialepyramiden.dk/>



Scope 3 Emissions - under construction

Reduce - Reuse - recycle

Some categories we can change right away

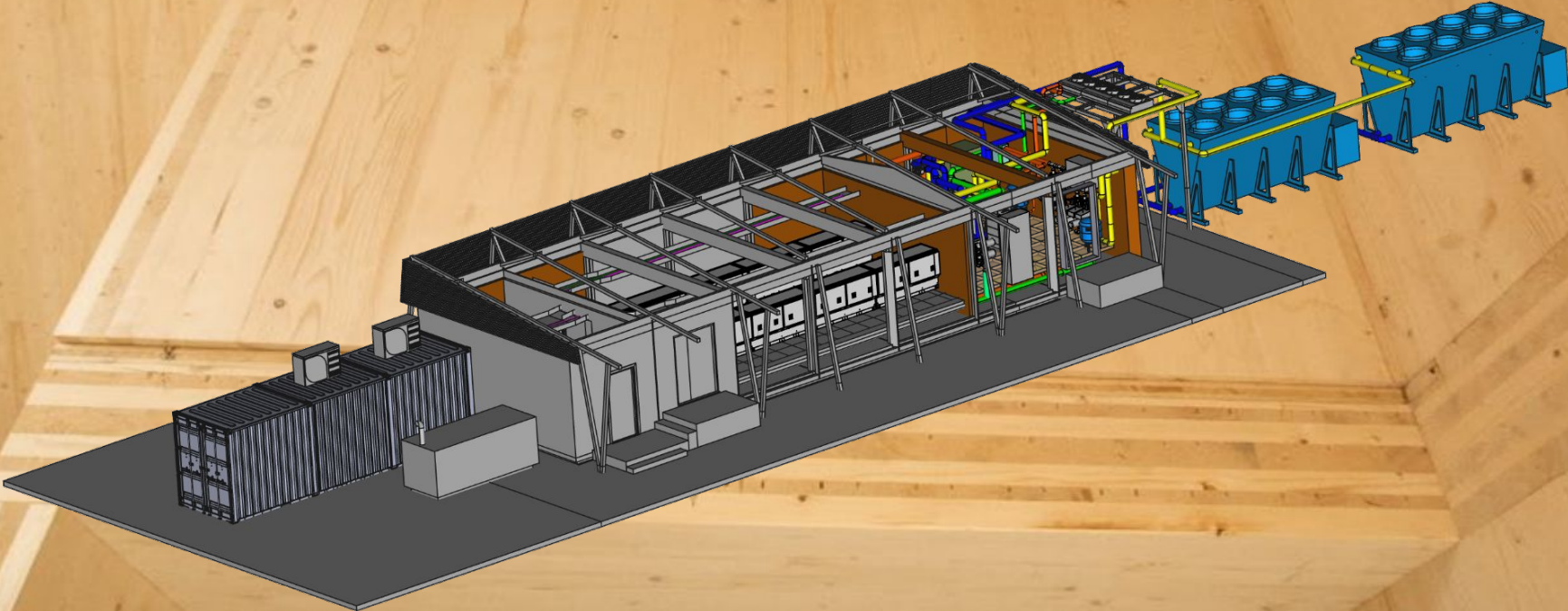
Others are under a big stretch

Some we have to compensate

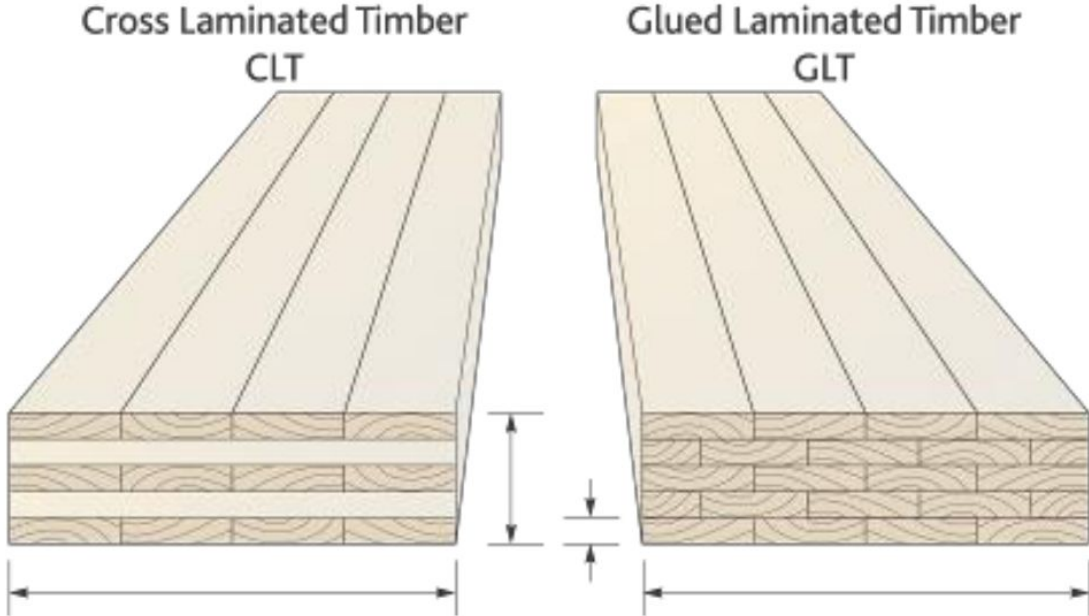
Shelter	Green
Server racks	Green
Climate systems	Yellow
Power Dist.	Yellow
UPS	Pink
Cabeling	Pink
Genset	Yellow
Security System	Pink
Heat reuse	Yellow

Scope 3 Emissions - solved

Shelter

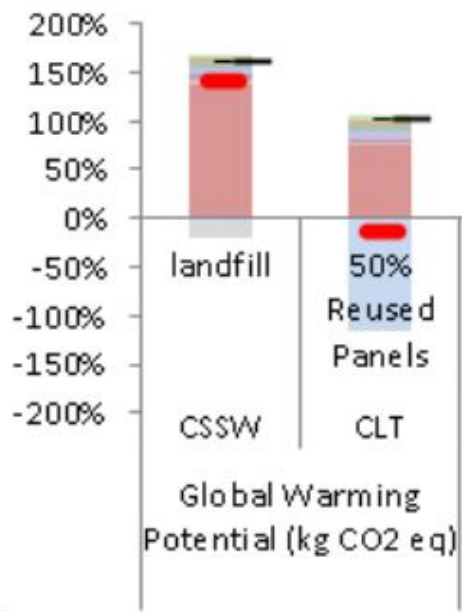


Cross-laminated Timber Construction



G-664

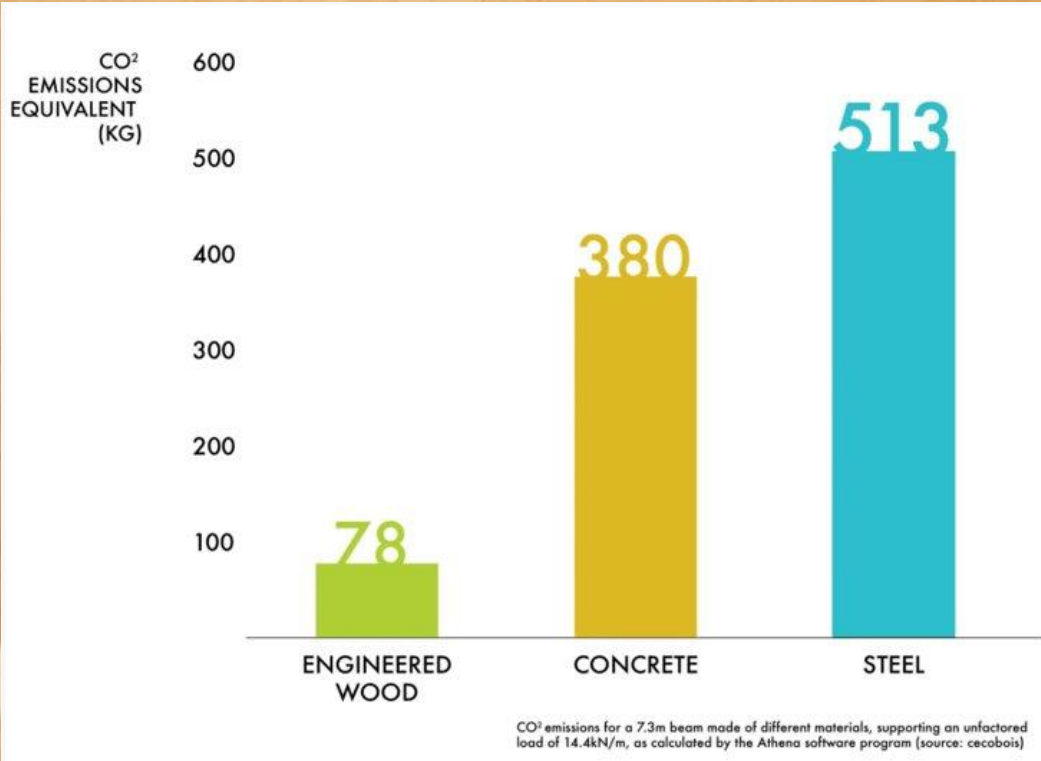
B



Global Warming Potential (kg CO₂ e q)

Why 2

Transition to a net-zero economic system



CO₂ emissions [tons/sec]
1'331

time left until CO₂ budget depleted
year month day hour min sec
6 11 30 0 21 28 47

CO₂ budget left [tons]
293'800'482'166



WOODEN DATA CENTER



Cross-laminated Timber Construction



Boden Type DC ONE, PUE 1,0148

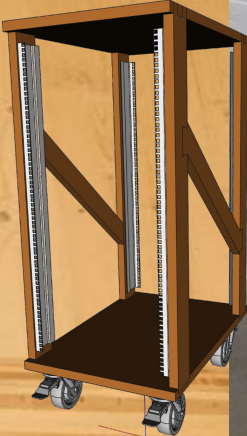
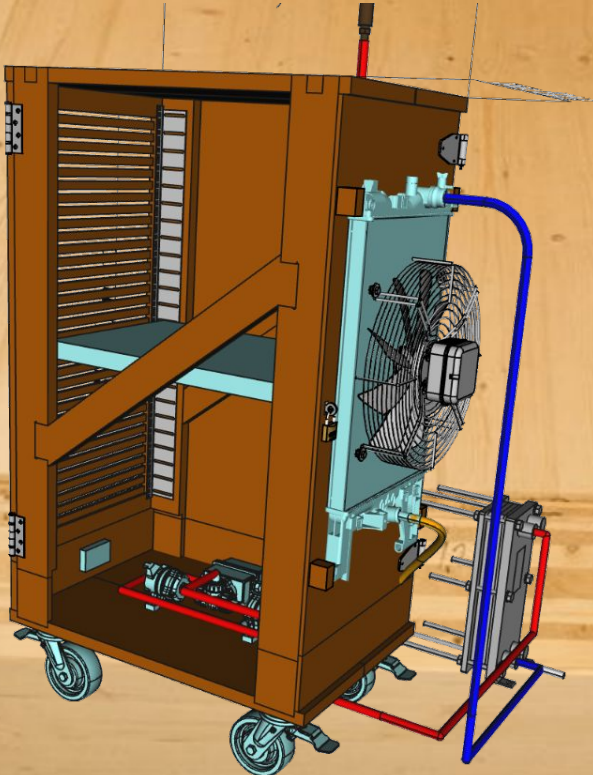
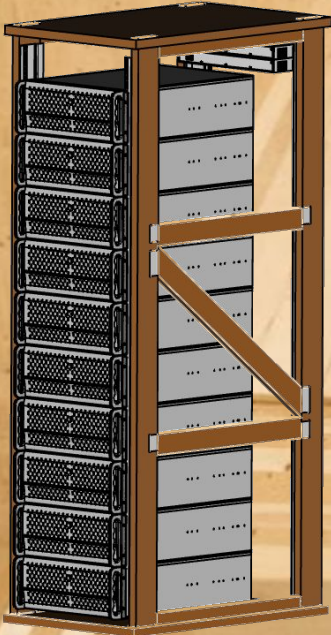


<https://ecodatacenter.se/>

Fire protective class F120, Tier 4 physical security

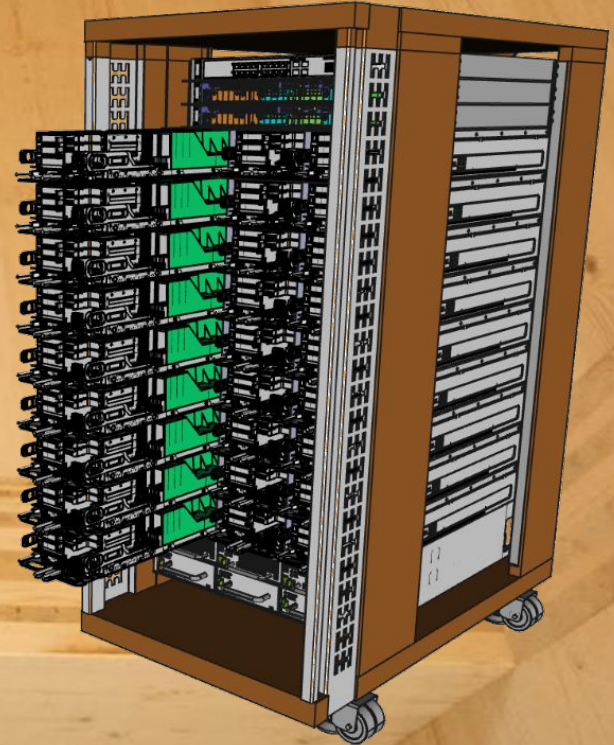
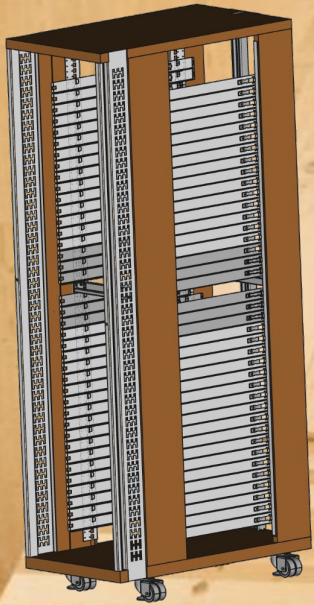
Scope 3 Emissions - solved

Racks



What

Wooden Racks products and solutions - DCP



What

Wooden Racks products and solutions - DCP and EIA OCP Prague & DCW Frankfurt



Armor-plated wooden infrastructure Tier 4

Weather protection

Insulation

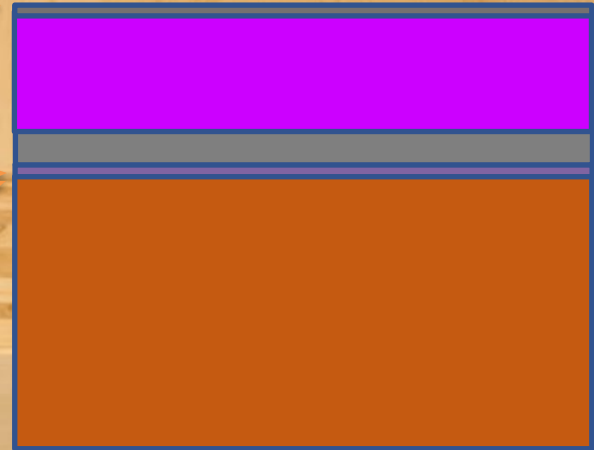
Armored Steel plate

Kevlar

Fire-protective coating

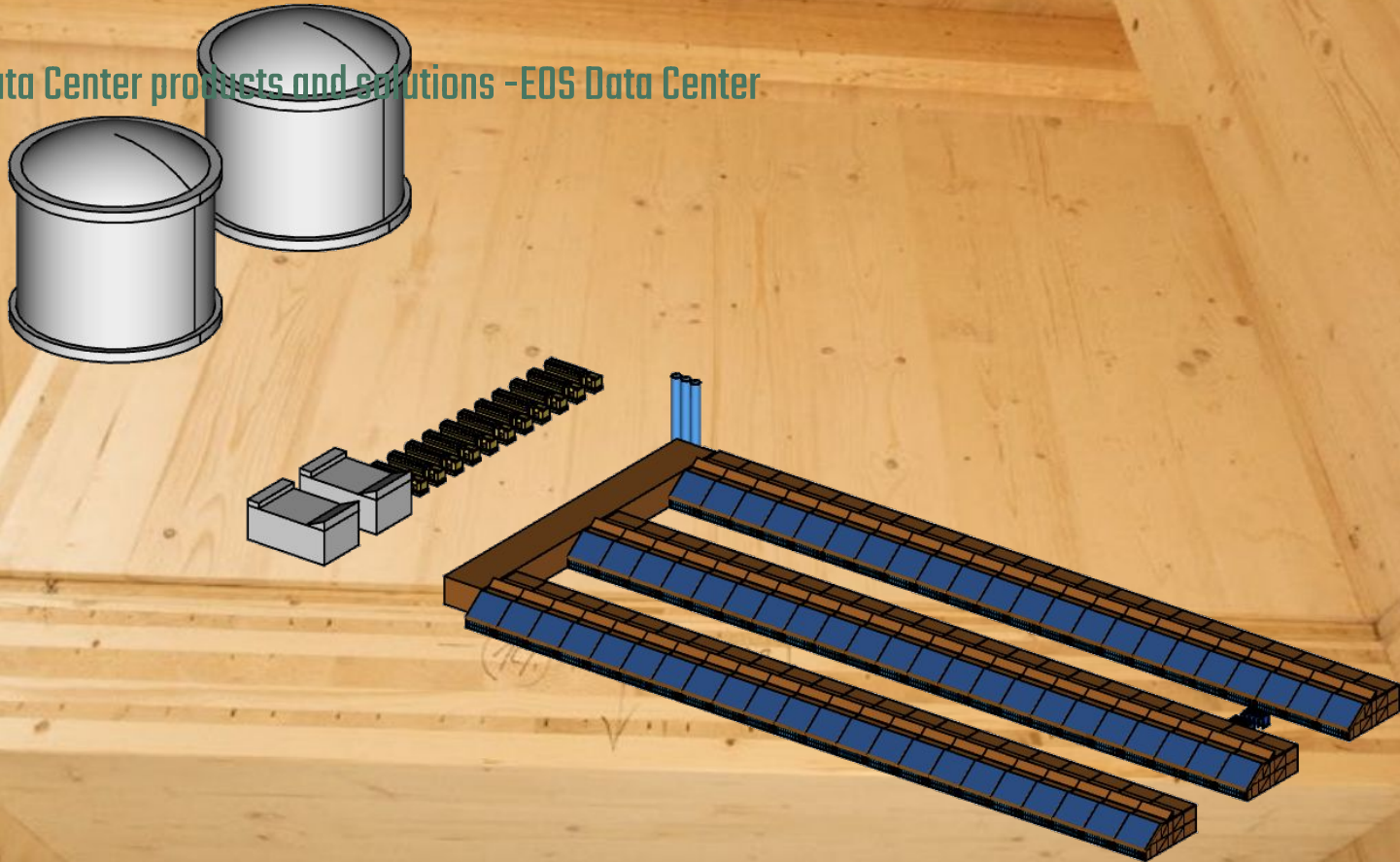
Wood (CLT, X-LAM)

Fire-protective coating



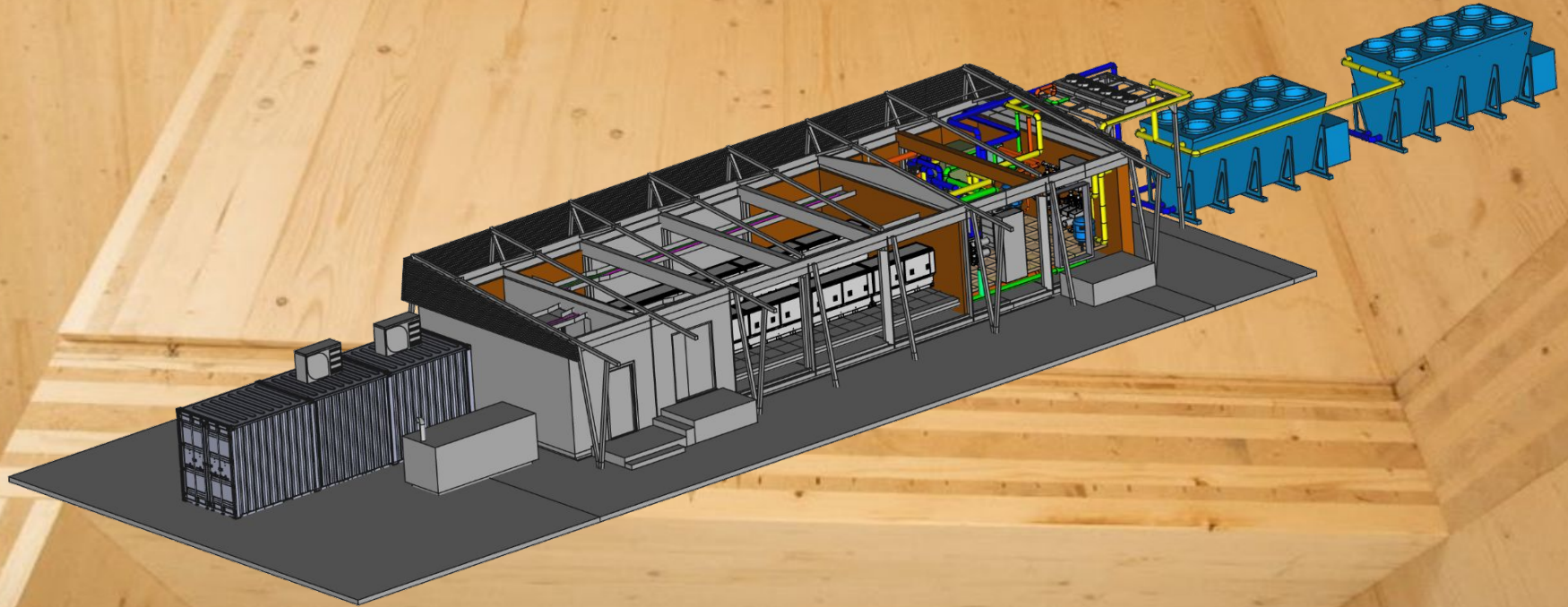
What

Wooden Data Center products and solutions - EOS Data Center



What

Wooden Data Center products and solutions - WoodenDataCenter 1 MW



Putting it all together

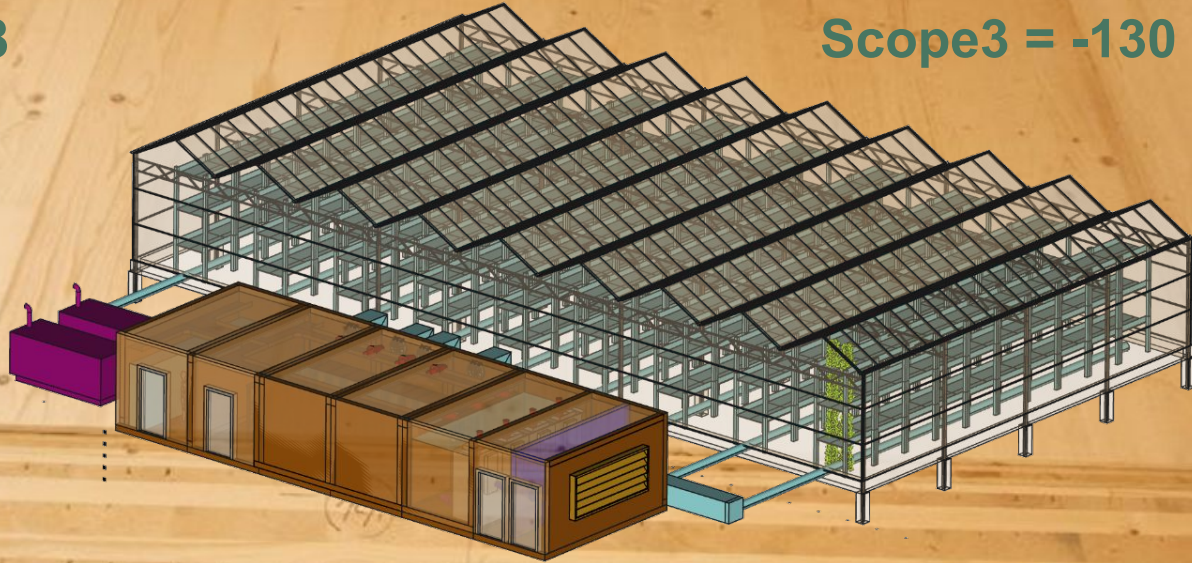
Wooden Data Center products and solutions - WoodenDataCenter 24R 170 kW



PUE = 1,08

Scope3 = -130 kg/m²

F120



ERF = 0,88

CAPEX = 5000 € / kW

How Carbon emissions Are Distributed in the Data Center

Greenhouse Gas Emissions

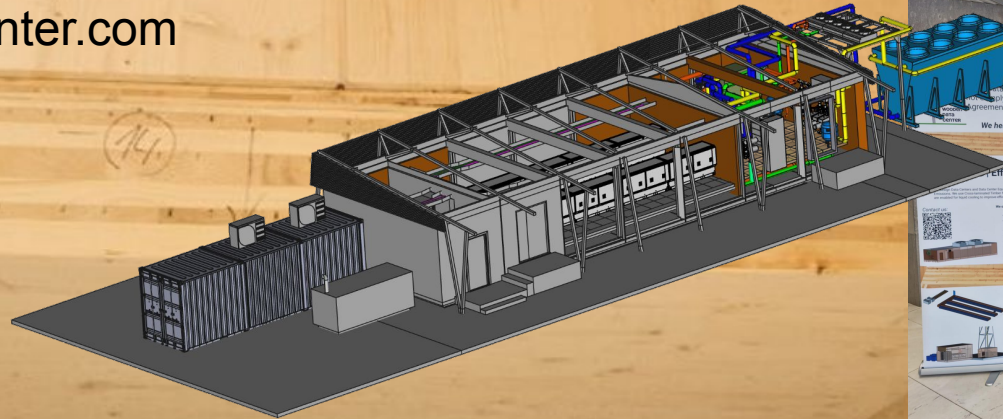
Scope 1 direct emissions	Scope 2 indirect emissions	Scope 3 supply chain emission
HVO Genset Onsite Generation	OCP Servers 20% ECOcooling high-efficient direct free cooling. High-efficient UPS PUE = 1,08 PUE = 1,05 (High Temo operation mode) Heat-reuse option vertical farming	Low carbon Server - Option Wooden construction Wooden Racks No pipes Low embedded Carbon = -0,13t/m²

Sustainable Now.

Nachhaltige Rechenzentren für den Planeten

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Same Fire Resistance Wood & Steel/Concrete!



Steel & Concrete

Steel

Wood

Temperature field of **steel concrete post** after 60 minutes

Temperature field of **steel post** after 60 minutes

Temperature field of **wooden post** after 60 minutes