
How to build distributed and sustainable data heating solutions
KUULEA

Kari Koivisto

Founder / CEO

An advocate for green technologies, a serial entrepreneur and an IT nerd

- 20 years of management experience in services and business development in ICT sector
- Many roles in international IT companies and startups as an entrepreneur, consultant, service developer, services manager and CTO
- Heart beats to the rhythm of the circular economy and the practical applications of green technology

Linkedin Tel. +358407744728

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Challenges related to the energy and heat production

- Climate change
- Legislation and international conventions
- Taxation and taxonomy
- Changed values of consumers and other interest groups
- There will be excess of electricity in the future
- New energy solutions are needed

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Challenges related to data centers and waste heat reuse

- Use of the computing capacity and the energy needs are increasing exponentially all over the world
- Large and centralised is not always sensible
- Large data centers produce large volumes of waste heat
- We need to more possibilities on how to utilize the waste heat from data centers

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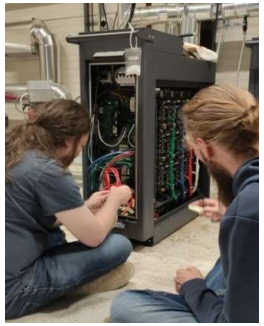
Our story

- Kuulea was founded on the desire to utilise the waste heat of data centres innovatively based on the principles of circular economy.
- Kuulea offers data heating services to ordinary buildings and carbon neutral high performance computing services.
  - Founded in November 2020 and have seven employees.
- Sustainability is a part of our DNA.
- We aim to become the most ecological company in the Nordic countries that focuses on distributed data center and heating services.
- We currently have around 15000 CPU cores installed in Finland.



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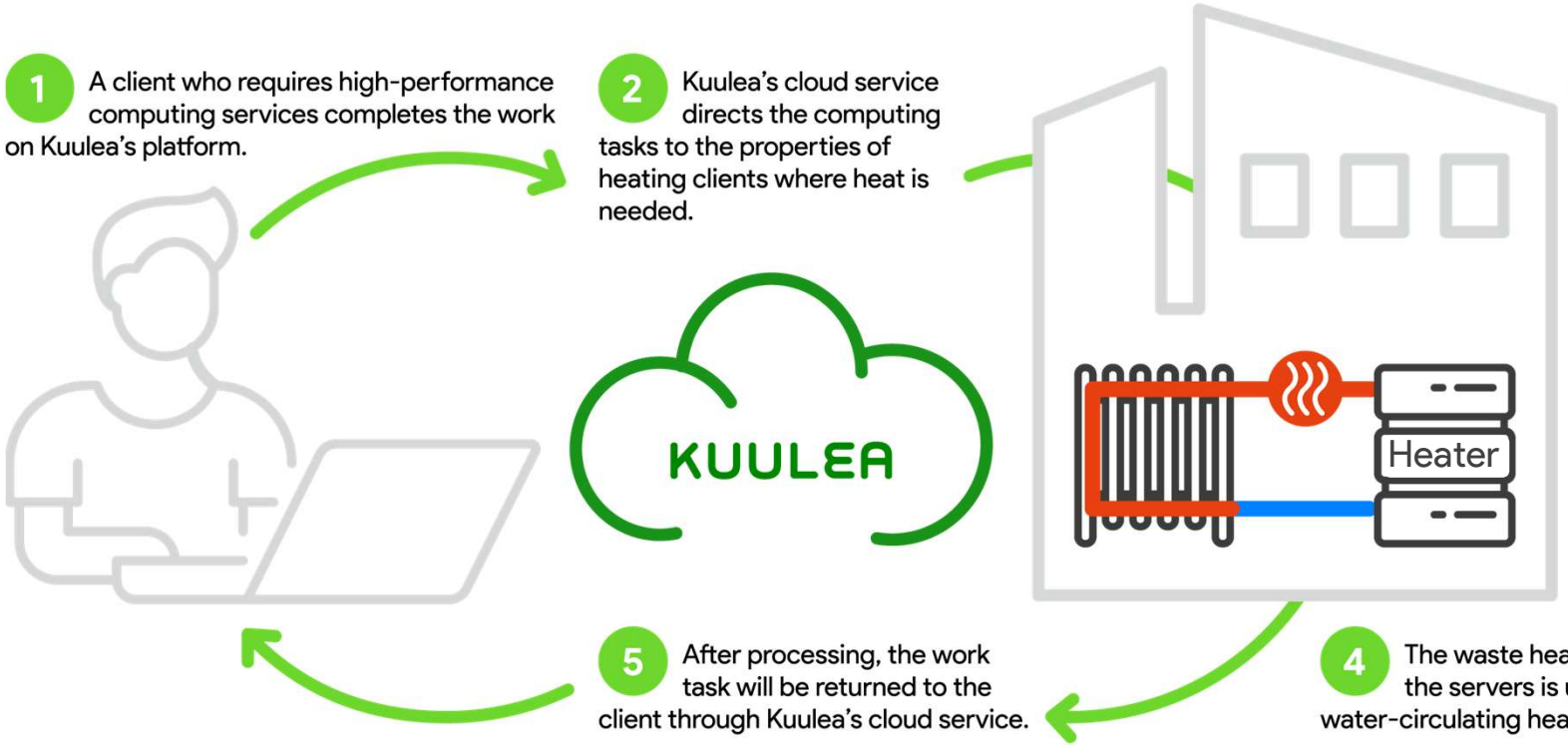
The circular economy way of operating data centers

Kuulea COMPUTING client

A design office, bank, or animation studio that requires high-performance computing services

Kuulea HEATING client

A client who has chosen an ecological form of heating



1. A client who requires high-performance computing services completes the work on Kuulea's platform.
2. Kuulea's cloud service directs the computing tasks to the properties of heating clients where heat is needed.
3. The work commissioned by Kuulea COMPUTING clients will be processed on Kuulea's specially manufactured servers that also serve as heaters. The heaters have been located in properties that need the heating service.
4. The waste heat that is generated by the servers is utilised in the property's water-circulating heating system.
5. After processing, the work task will be returned to the client through Kuulea's cloud service.

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When server is an actual heater?

The road to distributed edge heating and computing

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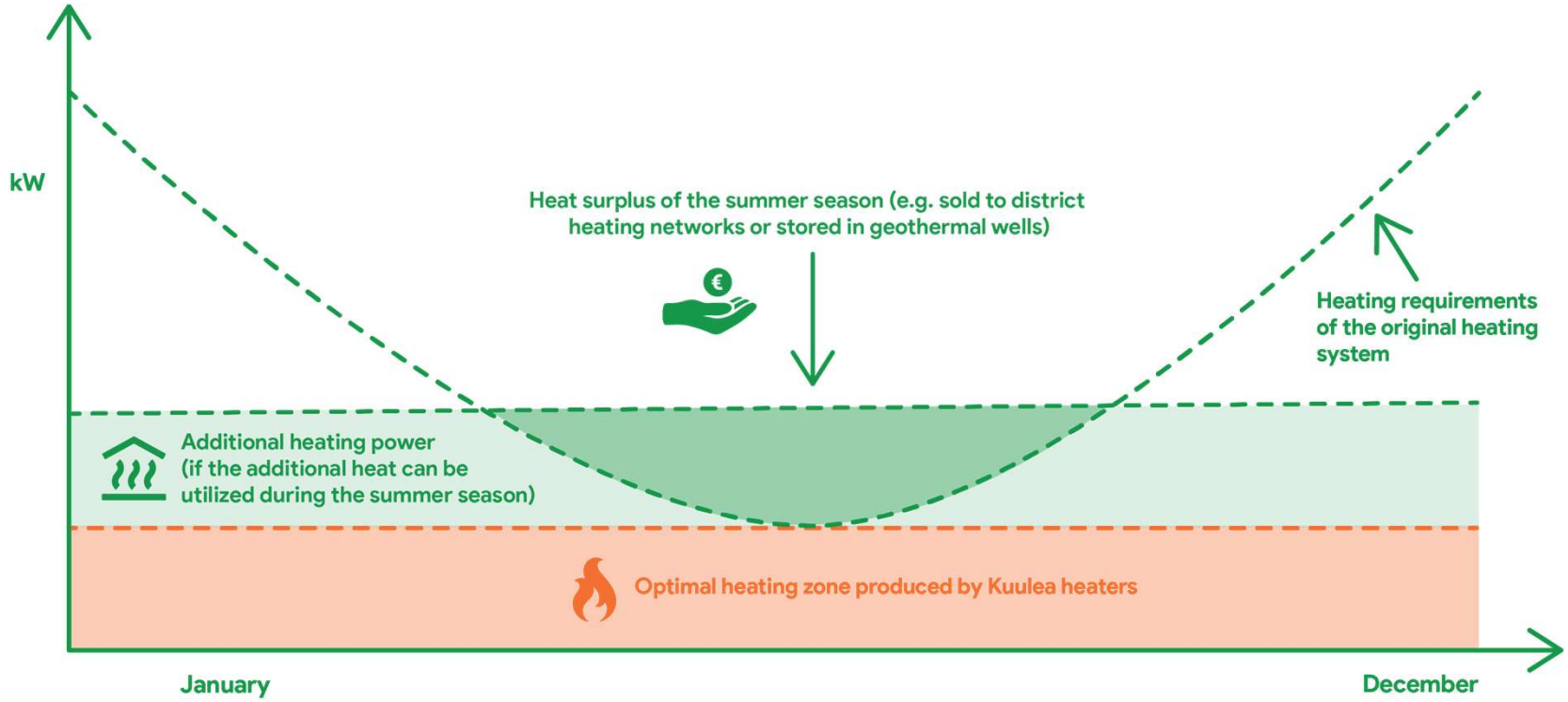
How to model the optimal heating solution for a building?



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Centralized vs decentralized DC comparison

	Centralized DC	Distributed DC made for heating
Applicable workloads and services	All kinds of services / workloads	Compute demanding or low lag workloads
Heat output per m2	Varies by server / services	High
Heat recovery model	Heat recovery from the air. Needs heatpumps. Waste heat is usually difficult to utilize outside the heating season	All of the waste heat can be utilized near 100% efficiency
Priming of the waste heat	Usually needed	Sometimes needed
Expandability	Constrained by the floorspace	Constrained by the floorspace and the heat output capabilities of the site(s)
Redundancy costs	Higher	Lower (redundancy is done by distribution)
Possible locations for DCs	Limited by many factors (electricity, waste heat utilization, land use, permits etc)	Almost limitless
Building and land costs	Higher	Lower (by utilizing existing buildings)
Operating and maintenance costs	Lower	Higher

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Business models for the heating

- New way of thinking: **Property heating is no longer a cost, instead can be a turnover enabler.**
  - Does the customer invest just in the heater part and/or the IT-part?
  - Does the customer get the heat for free?
  - Does the customer get revenue sharing for the computing part?
  - Can the customer utilize the heat in geothermal wells/heat batteries or in selling it to district heating companies?
- True HaaS (Heating as a service)?
  - The customer pays only a monthly fee

Case examples

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Case Kankaanpää with district heating

The CHP hybrid power plant used by Vatajankoski Oy utilises woodchips in the production of energy.

Vatajankoski Oy wants to discontinue burning, for which reason the company signed a € 10 million framework contract with Kuulea on replacing part of the energy production of the current CHP power plant with Kuulea's heaters.

Heat priming to 90C done by Polar night energy's sand battery with CO2 free electricity.

Sustainability views

Change to CO2 free heat production and end burning.

Possibility to decentralize disctrict heating networks to separate islands and produce heat on the edge of the heating network.

Case swimming pool

In Finland, a swimming pool needs to be heated constantly throughout the year and the heat requirement is several megawatt hours a year.

Vatajankoski Oy implemented a service solution in cooperation with Kuulea, where part of the heat needed by the swimming pools is produced by using Kuulea's heaters. This gives the client a more cost-efficient service and a smaller carbon footprint.

Sustainability views

Many swimming pools are old and are heated with oil and other fossil fuels.

RAKENNUSTEN LÄMMITYS

Tietokoneiden hukkalämpö lämmittää pian uimahallin Kankaanpäässä – uudenlainen malli vähentää päästöjä ja näkyy lämpölaskussa

Vastaavaa ei ole kokeiltu missään muualla.

https://yle.fi/uutiset/3-11872994

Case Kajawood movie studios

Kajawood Studios is technologically one of the world's most advanced film studio projects, where sustainable and ecological solutions and the creation of a cost-effective operating environment have been considered from the very beginning.

Kajawood Studios can significantly reduce the carbon footprint of film productions and promote sustainable development with the help of technological innovations. Properties and geothermal wells are heated with the waste heat generated from the creation of digital special effects, which brings considerable savings to the heating costs of the properties and the carbon footprint.

The special effects and post-processing of films and TV series are being computed with the computing power of the heaters.

Sustainability views

Substantially improved CO2 reduction in movie making.

KAJAWOOD STUDIOS

Sustainability

Notes on the sustainability


Thank you!
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