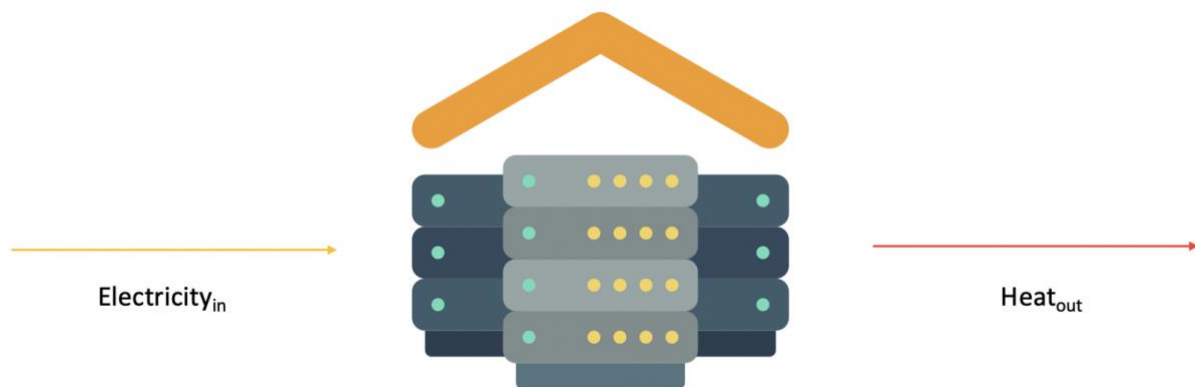


ONE PAGER

Data Center Heat as Energy Source



Technology in a nutshell: **'Data Center Heat'** as an **alternative energy source** to [Natural Gas](#) (in Amsterdam)

DATE: 15. March 2023

PLACE: Amsterdam, The Netherlands

AUTHOR: Aman Walia

CO-AUTHOR: Rob Rob de Laet

Data center heating for Amsterdam Zuidoost

Context of data center heating

Amsterdam aims to cut emissions by 55% by 2030¹ and be natural gas free by 2040², whilst providing low-carbon and affordable energy to their citizens. To achieve these ambitious climate targets and face up to the challenges of the present, it is crucial to start deploying alternative energy solutions (heat, electricity, transport, and industry) for the city.

One opportunity for these much needed alternative energy sources arises from data centers. Of which the vast majority in the Netherlands are located around Amsterdam. The current power consumption of these data centers amounts to about 1,3 billion KW, which eventually flows away in the form of heat... The price of energy is very much in flux, however the theoretical value of this amount of heat is worth somewhere between 1-1,5 billion euros. In most cases, sophisticated analysis is still required to facilitate a project of this form, but in some cases this analysis has already been carried out³.

The data center AM7 in Amsterdam Zuidoost produces heat which is estimated to around 61 million KWh per year and with this amount of heat can in principle supply 20 000 homes. Based on current prices, this heat represents a Net Present Value of around 30 million euros over a 20-year time period with a conservative discount rate of 5%. Since there are already plans for district heating in Amsterdam Zuidoost, it would be relatively easy to connect a group of apartments to hot water produced by the captured heat from the data center. For residents, this can offer an alternative to natural-gas or biomass powered district heating.

Business case

Data center heating is a proven concept⁴, albeit the (technical) challenges to adapt to the local context of a neighborhood or city. In current uncertain times and the ongoing energy crisis, tapping into such alternative energy solutions offers an opportunity which can create tremendous economic, environment and social value to all stakeholders. We propose that this could be achieved by creating a business model with the form of an Energy Service Company (ESCO) and following the framework of Doughnut Design for Business⁵. The business case for such a novel ESCo ("Explore Energy") is twofold:

- (1) The ESCo acts as an intermediary between the data center and the end-user and is responsible for operation and maintenance of the low temperature heat and cold network required to provide the heat from the data center AM7 in Amsterdam Zuidoost.
- (2) The ESCo acts as an advisor and driver for the Energy Transition by sharing 'best practices' to unlock the wider potential of data center heating in Amsterdam.

This will enable the creation of new jobs, the provision of affordable energy, compliance with new building regulations and advancement of scientific research for alternative energy solutions. The technical design of the low temperature network is illustrated in the figure below and described in detail in a separate document³.

With a relatively low capital investment of 4-4,5 million euros, this project could be set up within 2-2,5 years time and would save about 6.700 tonnes of CO₂ emissions per annum. The annual revenue of the project as heat provision is in place is estimated to be about 5-6 million euros.

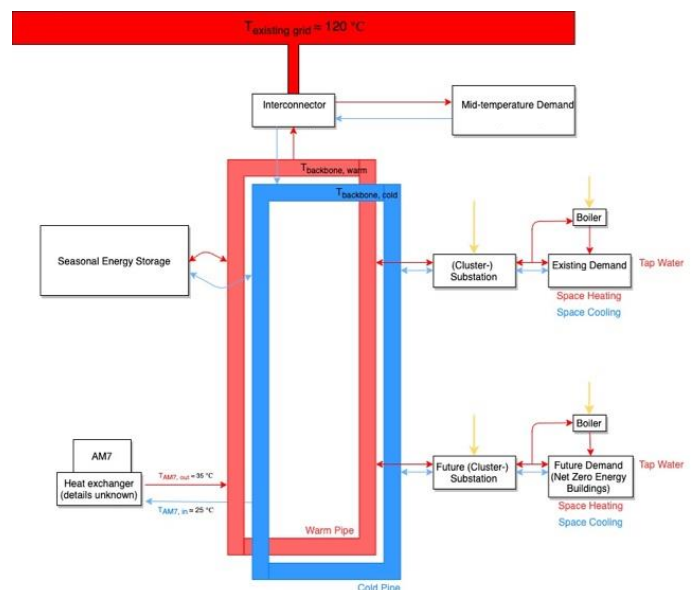
We are looking for an investment from interested parties, and a partnership with the Municipality of Amsterdam to set up the above described Energy Service Company with an co-ownership model, where the monetary proceedings of the heat network can be shared among the core stakeholders:

Co-ownership Bv ESCo Explore Energy: 60%

Heat delivery data center: 10%

Municipality partnership: 20%

Residents participation: 10%



Literature:

¹ Gemeente Amsterdam (2022). *Amsterdam klimaatneutraal*. <https://bit.ly/3F6sou6>

² Gemeente Amsterdam (2020). *Amsterdam aardgasvrij 2040*. <http://bit.ly/3ujmdh6>

³ Aman Walia (2021). *Towards 5th Generation District Heating and Cooling*. <http://bit.ly/3UrpWnh>

⁴ World Economic Forum (2022). *Sustainable data centre heating*. <http://bit.ly/3OVwSYW>

⁵ DEAL (2022). *Doughnut Design for Business*. <http://bit.ly/3B8jdrA>

Appendix – Key Figures

KEY FIGURES - BUSINESS CASE EXPLORE ENERGY

Timeperiod	20 Years		
NPV	€ 29.054.988	Total Emission Savings (t CO2e)	127.399 t CO2e
IRR	93%	Theoretical Monetary Value	€ 6.069.259
Paybacktime	2-2.5 Years		

ENERGY FIGURES

Data center capacity	10 MWpeak	
Annual data center heat output (estimated by operator)	61320 MWh/a	
Average annual heat demand per m2 (Netherlands)	37,8 kWh/m2	(incl. space heating and tap water)
Housing Equivalent (70m2)	70 m2	
	2.646,0 kWh/a	(per housing equivalent)
Supply	23.175 Housing Equivalents	