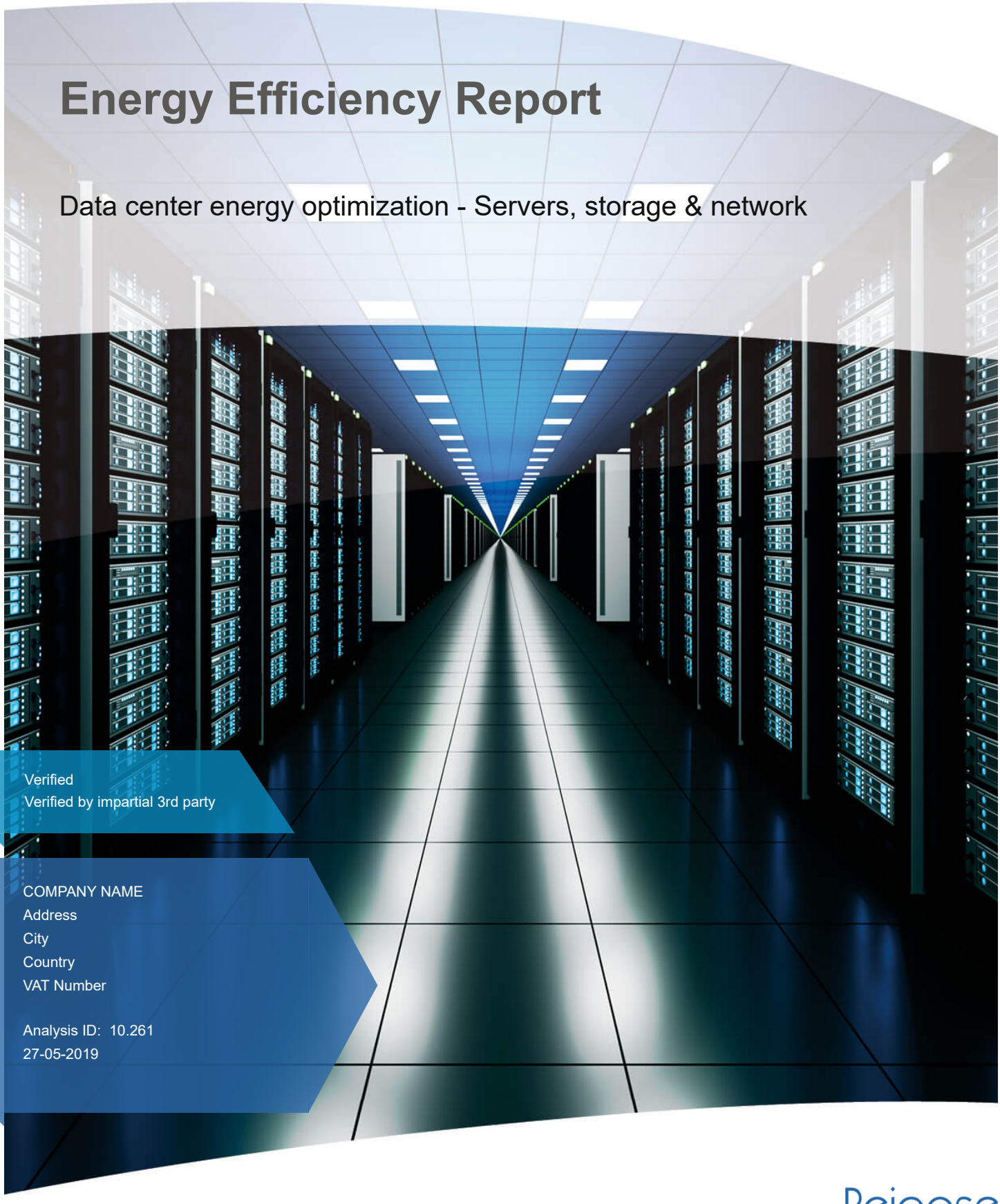
Rejoose

Energy Efficiency Report

Data center energy optimization - Servers, storage & network



Verified
Verified by impartial 3rd party

COMPANY NAME
Address
City
Country
VAT Number

Analysis ID: 10.261
27-05-2019

Preface

Rejoose raises awareness of the best environmental choice by having energy savings and CO2 reductions in focus, as well as providing the relevant information that provides the basis for making the best possible purchase decision.

The purpose of this report is to demonstrate the difference in energy consumption and CO2 emissions for two solutions and, thus, to create a basis for the decision-making process, involving parameters other than merely price and functionality. The content of this report is highly topical and must be viewed in relation to businesses' increasing energy consumption and the direct negative impact of this on the environment. Swedish senior LCA researcher Anders Andrae estimates that the energy consumption of the world's data centres will increase from 3% in 2018 to 20% in 2025, making this the most energy-using area in the ICT sector.

Vital initiatives, such as the EU Code of Conduct on Energy Efficiency on Data Centres and the UN Sustainable Development Goals, have arisen in response to current climate challenges. These 'best practice guidelines' are widely expected to become the basis for an upcoming European law on ensuring improvements to energy efficiency in buildings, industry and the ICT sector, including data centres. This report can effectively be included in a company's ongoing CSR activities and in any obligations and/or objectives related to the above.

The report underpins the energy-saving initiatives introduced by the EU and the UN to create the best possible basis for making decisions on new investments.

The method is verified by a third-party endorser of the EU Code of Conduct on Data Centre Energy Efficiency.

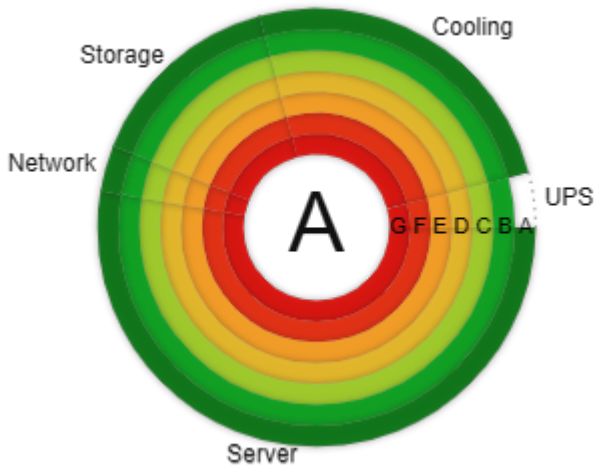
Compliance - EU code of conduct

- ☑ 4. Selection and Deployment of New IT Equipment (DCEE-2018-Ref. 4.1)
- ☑ 5. Deployment of New IT Services (DCEE-2018-Ref. 4.2)
- ☑ 6. Management of Existing IT Equipment and Services (DCEE-2018-Ref. 4.3)
- ☑ 17. Energy Use and Environmental Measurement (DCEE-2018-Ref. 9.1)

Executive Summary

This report contains an analysis and evaluation of E OPTIMO ApS current and future energy consumption, including environmental impact and business economics of the selected solution.

Future solution



Category	Rating	Part [%]	Consumption [kWh]
Server	A+	52,65	30.837
Network	A	3,41	1.997
Storage	A	14,75	8.636
Cooling	A	25,15	14.729
UPS	B	4,04	2.367
Total			**58.567**

		CO_2	Rating	Efficiency
UPS efficiency	94,6%	12 tons	A	100%
Cooling COP	2,98			

Energihjulet® visualizes the company's distribution of energy consumption with an indication of energy efficiency for each of the documented areas.

The Energy Wheel (Energihjulet®) gives a visual representation of the company's distribution of energy consumption, indicating the energy efficiency of each of the documented areas. An environmentally sustainable purchase has several parameters, and decision-makers need to compare investment, efficiency and environmental impact.

The analysis covers energy, environment and business economics. Results from analysed data show that all aspects of a new installation are above industry average, provided that the existing installation is representative of this. Energy efficiency factor of the future solution vs current solution is as follows:

Server	**4,9**
Network	**10,1**
Storage	**3,3**
Weighted total	**4,8**

The analysis demonstrates that the current installation doesn't comply with best practice on the market. Further studies and remedying actions by management are required to elaborate on the key weaknesses and strengths. From an energy and environmental perspective, it can be concluded that the proposed solutions will result in CO2 savings of 12,1 tonnes/year.

Operational savings are estimated to be 35.303 USD over 3 years.

Annual savings:

Economy	CO_2	Energy
11.768 USD	12,1 tons	58.838 kWh

Savings in perspective

Nature	Solar power	Lighting	Residential	Transport
1.070	**294**	**1.611**	**11**	**6**
Trees	**m2 solar cells**	**25W light bulbs**	**Houses**	**Cars**

Project Description

This report includes a review of the project's technical specification and a conclusion on its environmental and operational results.

** This text is editable **

The project focuses on demonstrating the best choices from an environmental and energy efficiency perspective. The comparison forms the basis for targeted decisions that promote a focus on energy-efficient operation and future operating costs.

The report is prepared in an impartial and verified documentation tool, with the aim of highlighting the future operational and environmental consequences - when choosing one or several solutions.

The documentation can also be used for internal and external CSR profiling. The focus area is part of a comprehensive strategy that promotes a worldwide energy saving effort - and harmonizes with the EU's objectives in this area.

The report is prepared in approx. 15 min. when data for current and new solution is known.

1 - Create project and project description.
2 - Select devices for the current solution.
3 - Select devices for the future solution.
4 - Generate Energy Efficiency Report and customize it. Print or save as PDF.

The Energy Wheel shows optimization in Energy Efficiency from the EU's G to A scale. A + and A ++ are respectively. 1-2 years ahead of 'best practice' in the field.

Operational Results

Implementation of this project results in operational gains in the form of reduced costs and/or more energy-efficient production. The benefits of the project are summarised below.

Current solution		
	Category	Cost
	Server	10.170 USD
	Network	2.023 USD
	Storage	4.433 USD
	Ups	949 USD
	Køling	5.905 USD
	Total	**23.481 USD**

Future solution		
	Category	Cost
	Server	6.167 USD
	Network	399 USD
	Storage	1.727 USD
	Ups	473 USD
	Køling	2.946 USD
	Total	**11.713 USD**

Operational results are estimated in the table below over 1 year, 3 years and 5 years, respectively. The results are based on operating costs at an energy price of 0,20 USD pr. kWh

Annual operational savings	**11.768 USD**
Operational savings over 3 years	35.303 USD
Operational savings over 5 years	58.838 USD

Summary - Energy and CO_2 Results

Implementation of this project results in environmental savings in the form of energy and CO2 reductions and/or more efficient production. The effects of the project are summarised below. The outcomes depend on the CO2 factor [g/kWh] applied.

Current solution		
	Category	Total
	Server	50.852 kWh
	Network	10.117 kWh
	Storage	22.163 kWh
	Ups	4.745 kWh
	Køling	29.527 kWh
	Total	**117.404 kWh**

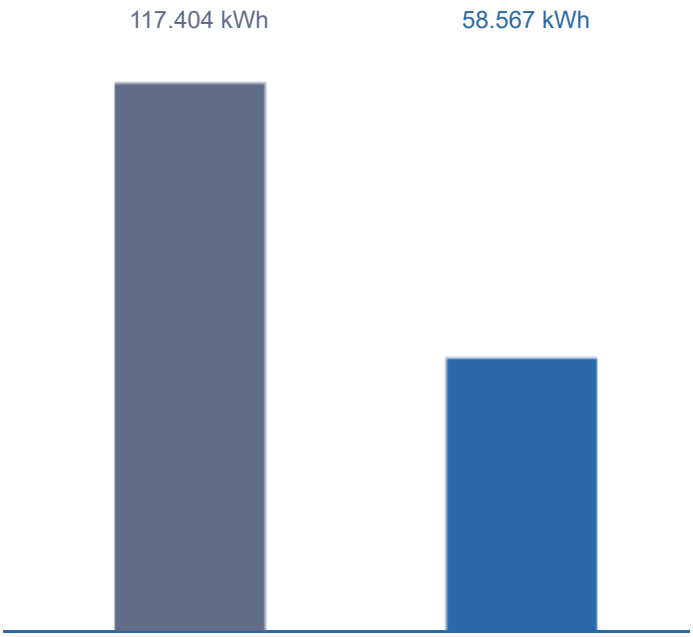
Future solution		
	Category	Total
	Server	30.837 kWh
	Network	1.997 kWh
	Storage	8.636 kWh
	Ups	2.367 kWh
	Køling	14.729 kWh
	Total	**58.567 kWh**

The CO2 factor used to calculate the environmental impact of the optimisation is 206 grams per kWh.

One knock-on effect of the energy savings realised by the project is a reduction in the focus area's carbon footprint, equivalent to 12 tonnes/year.

Annual Energy Saving	**58.838**	**kWh**
Energy saving over 3 years	176.513	kWh
Energy saving over 5 years	294.188	kWh

Annual CO2 savings	**12**	**ton**
CO2 savings over 3 years	36	ton
CO2 savings over 5 years	61	ton



Energy Efficiency

Specification of energy efficiency enables comparison of equipment and hardware and adds energy consumption to the agenda of decision-making processes.

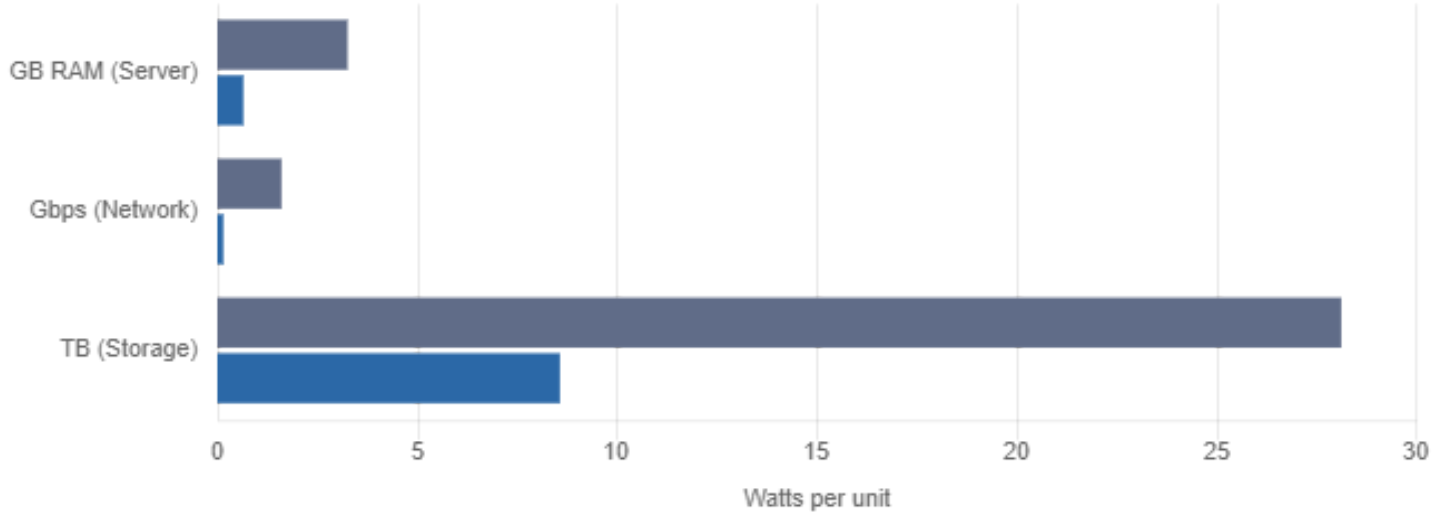
Results of Energy Efficiency

Implementation of energy efficiency measures is a crucial parameter and is a more long-term solution than mere energy savings. In the future, the EU will measure companies by their energy efficiency, and may even require them to be more energy-efficient than the market standard. Energy efficiency is an expression of how efficiently absorbed energy is used.

The graph illustrates watts per production capacity of thThe graph illustrates watts per production capacity of the existing and the new solution. As shown in the graph, the existing server-environment 3,24 watt pr. GB RAM and the new server-environment 0,65 watt pr. GB RAM making the new environment 4,9 times more efficient.

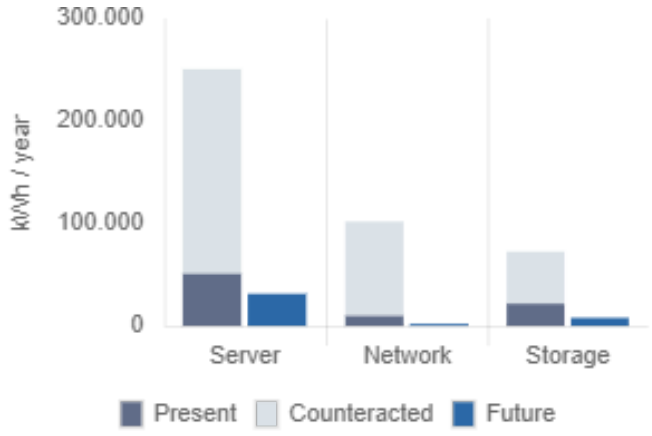
Consumption comparision

The following illustrates energy efficiency per focus area, calculated in watts per production unit.



Energy efficiency factor

The graph on the right illustrates how energy consumption will increase if energy efficiency measures are not implemented. This corresponds to extending the existing solution by adding equipment with equivalent energy efficiency. The subtotal for each focus area is shown by a factor that indicates by how much the energy efficiency is increased.

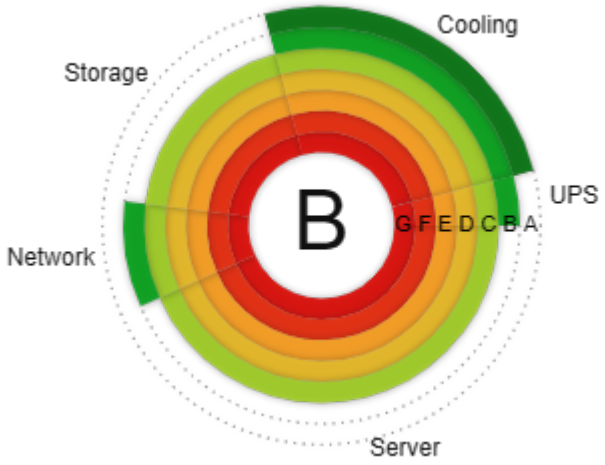


Category	New capacity	Unit	Factor
Server	**5.376**	**GB RAM**	**4,9**
Network	**1.440**	**Gbps**	**10,1**
Storage	**115**	**TB**	**3,3**

Energy Wheel

Energihjulet® (Energy Wheel) gives a visual representation of the company's distribution of energy consumption, indicating the energy efficiency of each of the documented areas. Energihjulet® provides the company with a balanced picture of the company's level of optimisation and the potential for savings. Energihjulet® can be used as a supplement to energy labelling. This model weights each area separately and provides an overview of the energy savings potential.

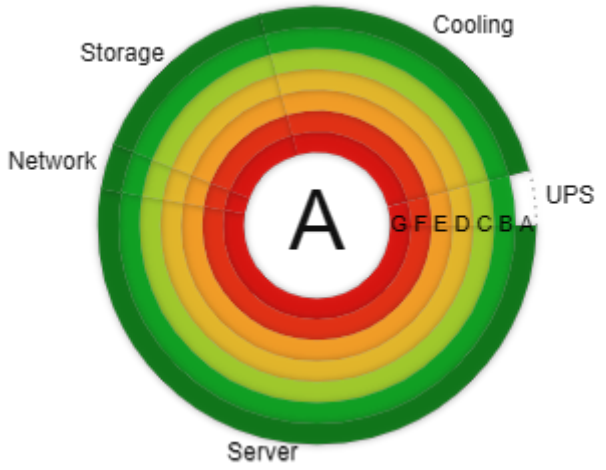
Current solution



Category	Rating	Part [%]	Consumption [kWh]
Server	C	43,31	50.852
Network	B	8,62	10.117
Storage	C	18,88	22.163
Cooling	A	25,15	29.527
UPS	B	4,04	4.745
Total			**117.404**

		CO_2	Rating	Efficiency
UPS efficiency	94,6%	24 tons	B	88,2%
Cooling COP	2,98			

Future solution



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Storage		A	14,75	8.636
Cooling		A	25,15	14.729
UPS		B	4,04	2.367
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EUIPO
EUROPEAN UNION
INTELLECTUAL PROPERTY OFFICE

Energihjulet® is a design patent registered with Rejoose.

Patent/design no.: 005240405

Summary

Annual energy savings	58.838	kWh
CO_2 reduction	12	ton
Annual operational savings	11.768	USD