DI Digital

DANISH DATA CENTER INDUSTRY

The backbone of digitalisation

Data centres in Denmark drive the modern digital society, contribute to the green transition and create jobs and economic activity

June 2025

IMPLEMENT CONSULTING GROUP

Preface

Data centres are the backbone of our digital society. Every day, whether in our private lives or at work, we Danes are in touch with numerous data centres. When we buy goods online, use social media, visit the doctor, or have online meetings at work – this only works if the different data centres are running. And fortunately, data centres do so all the time. If the electricity supply were to fail, which fortunately is quite rare in Denmark, data centres have backup power systems that ensure they stay online until the electricity grid is restored. This provides security and confidence that even in critical situations, Danish society will have a reliable digital infrastructure.

The demand for digital services is increasing rapidly. Citizens, businesses and the public sector demand reliable handling of data, heavy compute power and artificial intelligence, which is why the industry is expanding its capacity. This is also seen in the electricity grid, where data centres currently account for 7% of Danish electricity consumption. This is a large share, but it is important to highlight that data stored in large and efficient data centres uses significantly less power than if the same data were distributed across on-premise servers in individual companies. This efficiency means that despite a large increase in the volume of data created, we have not seen a proportional increase in the energy required.

But we cannot get around the fact that we as an industry use a lot of electricity. Therefore, data centre operators are investing heavily in renewable energy projects that will add at least as much new, green energy as the industry itself uses. This also applies in Denmark, where many solar and wind projects have been established because of investments from the data centre industry. High power consumption also generates a lot of heat that data centres must get rid of, and this heat can be utilised in the district heating sector. Currently, more than 15,000 households receive heat from data centres, and the potential is far greater.

In addition, data centres support digital solutions that can contribute to Denmark achieving its climate goals. Smart grids, precision agriculture and energy-efficient buildings all require data-intensive technology that needs to be scaled if we want to reduce CO_2 emissions significantly. Digitalisation and the roll-out of artificial intelligence are also important ingredients in making Danish society more efficient and competitive. They create economic development and higher prosperity for the benefit of citizens, businesses and public welfare.

However, the growth of the data centre industry and, not least, the speed of its growth also poses challenges. Can the expansion of renewable energy and the necessary infrastructure to move energy where it is needed keep up? The pressure on the electricity grid is increasing, and very large investments must be made not only because of data centres, but also because of the ambition to electrify large parts of Danish society, such as the heating sector, the transport sector and several other sectors.

This requires new solutions, political action and massive investments - and it must happen quickly. We must implement the technologies and business models needed to succeed across industries and public authorities. As an industry, we are ready to take an active part in this work and contribute with knowledge, technologies and investments that ensure a green and sustainable future for Danish society.

This report aims to provide the public and decision-makers with a fact-based understanding of the role of data centres in Denmark. If we want to maintain our competitiveness and meet our green ambitions, then secure, efficient and increasingly green data centres are indispensable. We hope that the study can inspire a constructive dialogue between the industry, authorities and decision-makers – so that the digital engine can continue to run strongly, reliably and sustainably.

Henrik Hansen
CEO,
Danish Data Center Industry

Andreas Espersen
Industry Director,
DI Digital

Summary | Data centres constitute the backbone of modern digital society and support Denmark's competitiveness

Data centres are central to most digital services as they store, process and distribute large amounts of data around the clock. They support important societal functions such as health care, education and public administration.

A person in Denmark is in touch with several data centres every day when they check the weather forecast in a weather app, pay at the bakery with a bank card on their phone or watch a series in the evening via a streaming service.

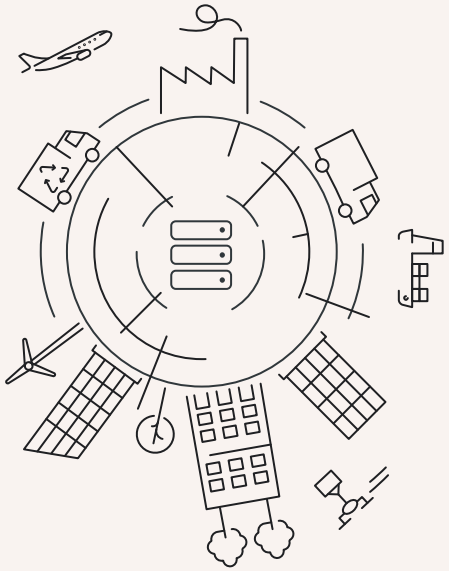
Denmark has 49 data centres spread throughout the country, and several new data centres are being built or planned.

Data centres are crucial for Danish companies to reap the productivity gains of future technologies such as artificial intelligence, which could yield a productivity potential of up to DKK 250 billion at widespread adoption. The use of cloud already supports a productivity potential of DKK 36 billion to Danish GDP.

Modern data centres ensure the best cyber security in Danish businesses and public institutions. Data centres are secured against both physical and modern hybrid threats. Businesses of all kinds connect to data centres via high-speed networks to ensure that their operations and all types of digital services can run quickly and reliably for users.

> More large data centres are crucial for us to be able to further power Danish innovation and the use of the technological solutions of the future. They create the digital foundation that our companies, researchers and authorities need to be able to exploit the potential of artificial intelligence and secure Danish positions of strength in global competition.

Caroline Stage, Minister for Digitalisation, in Børsen



Summary | Data centres in Denmark contribute to the green transition and create jobs and economic activity

The data centre industry is energy-intensive but invests heavily in renewable energy to support the Danish electricity grid. Data centres consume significant electricity to meet the growing demand for digitalisation and AI. The data centre industry's share of Denmark's electricity consumption has increased to 7%. At the same time, large data centre operators are investing heavily in renewables, adding at least 560 MWp of additional renewable capacity to the Danish power grid.

Several large operators have adopted green-power requirements that go beyond regulatory standards. For example, they pursue 24/7 CO_2-free targets, hourly matching and global CO_2-neutral operations.

Data centres enable digital technologies that can support reductions in CO_2e emissions corresponding to 20-25% of Denmark's 2030 target. Data centres provide critical computing power to support vehicle electrification, optimisation of manufacturing processes, and implementation of precision farming, reducing environmental impact. Additionally, they help with advanced management of building operations and utilise their surplus heat in the district heating system to achieve energy efficiency improvements.

Looking ahead, data centres could play an even greater role in ensuring grid stability and flexibility. The large share of renewable energy in Denmark generally leads to more frequency deviations in the electricity grid. Data centres that are designed to do so can play a key role in promoting grid stability and flexibility in the future through fast frequency response (FFR) and load-shifting. Today, Danish data centres do not provide flexibility services to the electricity grid, as they are not designed to do so, and because there is a lack of clear financial incentives, guidelines for the technical requirements and broad implementation of the necessary control and battery technologies.

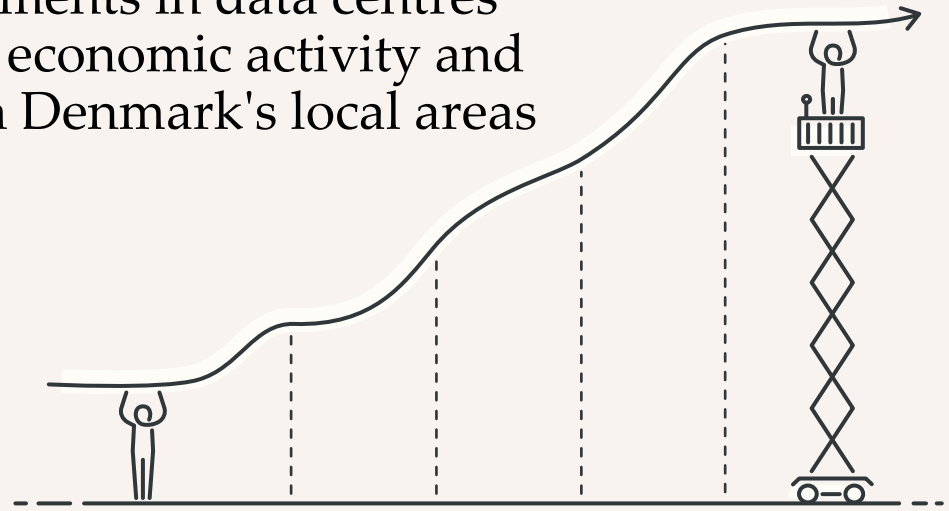
Data centres supply district heating to approximately 15,000 households in Denmark, but technical, geographical and regulatory barriers hinder the sector from realising its full potential.

In 2024, the data centre industry supported 5,400 jobs in Danish local areas and contributed DKK 3.4 billion to GDP. The construction and operation of data centres create jobs and generate value not only within the centres themselves, but also indirectly through their supply chains and more broadly across the Danish economy.

By 2028, the data centre industry is expected to grow by 160%, supporting 18,000 jobs and contributing DKK 11.4 billion to GDP. This growth is driven by large data centre investments in the coming years and the deployment of large data centres in Denmark.

Local and global expansion in the data centre industry creates export opportunities for Danish companies, allowing them to develop expertise in a booming domestic market and apply it internationally in one of the world’s fastest-growing sectors.

Investments in data centres create economic activity and jobs in Denmark's local areas

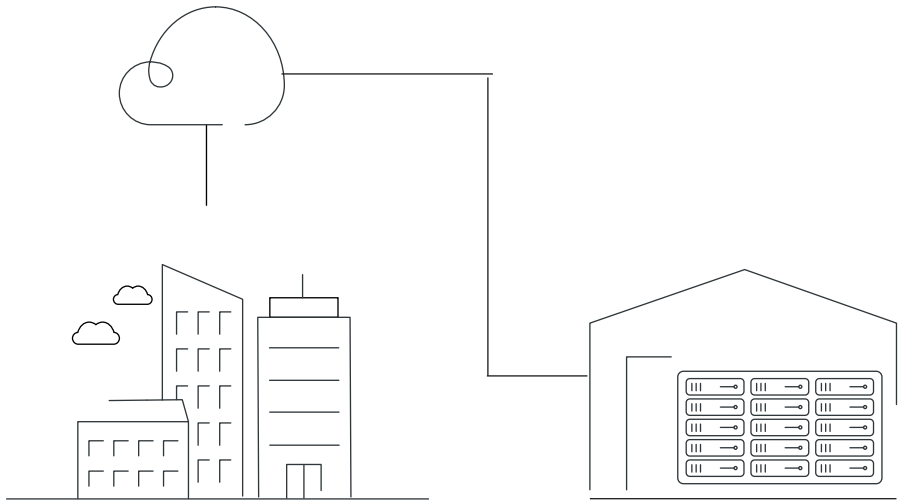


Infographic | We use data centres many times every day

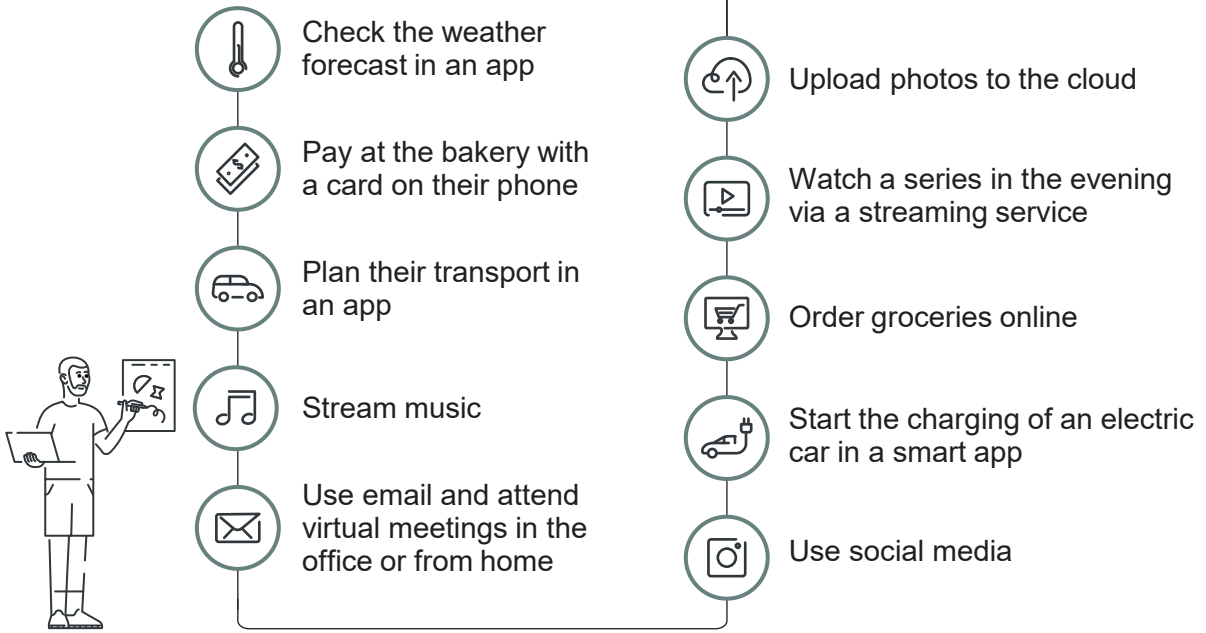
What is a data centre?

A data centre is a specially designed building or room filled with thousands of computers (servers) that together store, process, and transmit large amounts of data around the clock.

Businesses of all kinds connect to data centres via high-speed networks to ensure that their operations and all types of digital services can run quickly and reliably for users.



A person in Denmark is connected to several different data centres every day, including when they...



Infographic | Data centres constitute the backbone of our modern digital society

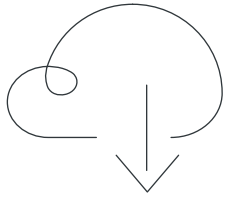
Data centres play a crucial role in many societal functions that benefit Danes every day

Data centres in Denmark support e.g.:

Health care	Cloud-based imaging diagnostics Stable telemedicine (e.g. video consultations)
Police and emergency services	Live storage and streaming of video surveillance Secure analysis of evidence data
Teaching	Streaming digital learning materials Scalable e-learning
Business and industry	Real-time warehousing & logistics and cloud-powered e-commerce Intelligent production
Public administration	Online self-service of public services Central protection of tax and passport data

Data centres help make Danish companies and the public sector more productive, e.g. when they use...

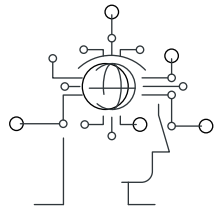
Cloud solutions



+ DKK 36 billion GDP

contribution in 2023 from the use of cloud

Artificial intelligence



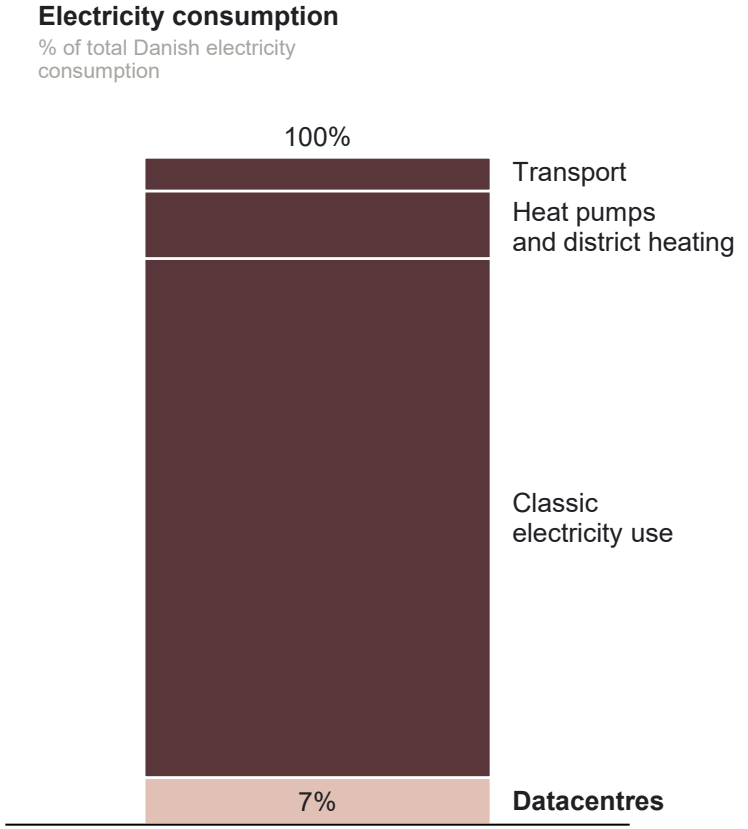
+ DKK 200-250 billion GDP

annual potential from widespread adoption of generative AI

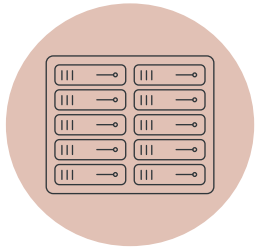
> The goals for the EU's digital transformation of businesses state that by 2030, three out of four EU companies should use cloud computing services, big data and artificial intelligence.
>
> **European Commissions in *Europe's digital decade: 2030 targets***

Infographic | Data centres contribute to the green transition in Denmark

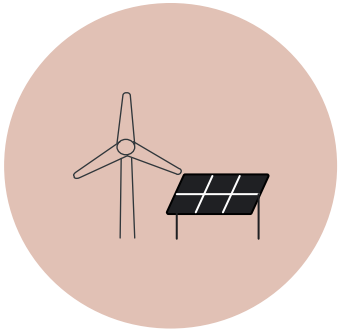
The data centre industry consumes a lot of electricity...



… but invests heavily in renewable energy...



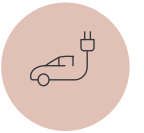
335 MW installed capacity in Danish data centres



+560 MW of additional renewable energy capacity added by hyperscale operators to the Danish grid

Several hyperscale operators strive for the highest possible share of green power in partnership with their energy supplier, either on an annual or hourly basis. For example, in 2023, 92% of the power used by Google's data centre in Fredericia was green.

… and supports digital and circular solutions that are essential for the green transition



20-25% of reductions in CO_2e emissions towards 2030 are supported by digital technologies enabled by data centres.

15,000 households in Denmark today receive district heating from data centres, and operators are considering district heating as a solution already in the building phase of new projects.

In the future, data centres can further contribute to the stability and flexibility of the electricity grid through fast frequency response (FFR) and load-shifting.

Infographic | Data centres create stable jobs and economic activity in local areas

Data centres in Denmark support economic activity in local areas

Direct

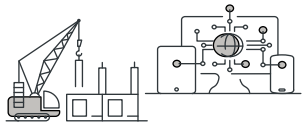
Job and value creation from the activities that take place at the data centres during the construction phase and during operation.

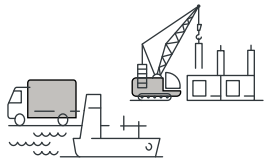
Indirect

Job and value creation within the data centres' subcontractors and service providers.

Induced

Broader economic job and value creation when salaries paid to employees and suppliers are used in Denmark.

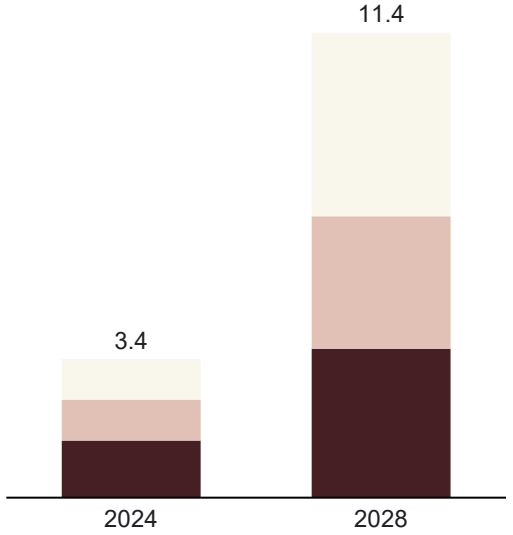




By 2028, data centres are expected to contribute DKK 11.4 billion to GDP and support 18,000 jobs

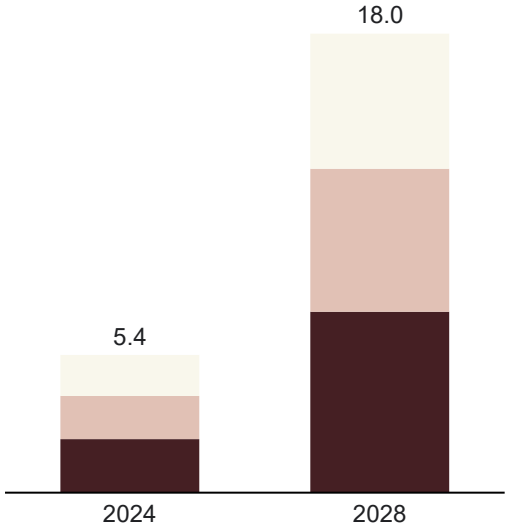
Data centres' contribution to Denmark's GDP (annually)
DKK billion (2024 prices)

GDP



Data centres' contribution to Denmark's employment
1,000 full-time employees

Jobs



Content

Glossary

24/7 CFE (24/7 Carbon-Free Energy): Ambition to match a data centre's hour-by-hour electricity consumption with production from CO_2-free sources instead of e.g. annual offsetting.
AI (Artificial Intelligence): Programmes and systems that can learn from data and perform tasks that normally require human intelligence (e.g., image recognition or language understanding).
Application/Web Server: The server in a data centre that runs the service itself (app or website) and processes user requests, authentication and more.
Backbone network: High-capacity fibre infrastructure that connects major data centres and network nodes across countries and continents.
BESS (Battery Energy Storage System): Large battery storage that can store surplus power and deliver power at the grid's load peaks.
GDP (Gross Domestic Product): The value of all goods and services a country produces in a year.
CCS (Carbon Capture and Storage): Technology that captures CO_2 from e.g. power plants and stores it permanently underground.
CDN/Edge node: Geographically located server point close to the user that fast-caches content to reduce latency.
Cloud computing: Delivery of IT resources (servers, databases, software) via the internet on demand and with a pay-as-you-go model.
Colocation data centre: Facility where multiple independent customers rent space, power, and cooling, but bring their own servers.
CSP (Cloud Service Provider): Company that offers cloud services (e.g. AWS, Azure or Google Cloud).

Data centre: Purpose-built building with thousands of servers, advanced cooling, emergency power and networking where data is stored and processed around the clock.
DESI: EU's Digital Economy and Society Index, which measures countries' digital maturity.
Enterprise data centre: Internal data centre owned by one organisation for its own business-critical systems.
Firewall: Security system that filters traffic to/from a network to block unwanted or malicious requests.
District heating: Centrally produced heat that is distributed as hot water in pipes to buildings – data centres' surplus heat can be connected to the grid
GFLOPS (Giga Floating Point Operations Per Second): Measures how many billions of floating-point calculations a processor can perform per second; used to estimate raw computing power.
GoO (Guarantee of Origin): Certificate documenting that one MWh of electricity comes from a renewable energy source.
Fast Frequency Response (FFR): The ability of devices such as battery storage, inverter-based resources, or turbines to measure changes in the frequency of the grid and, within seconds, to automatically add or decrease active power to stabilise frequency in the event of major deviations.
Hyperscale data centre: Extremely large, modular data centre typically owned by large, global tech companies; designed for fast scaling and high energy efficiency.
Inference: When a trained AI model is used to provide an answer or prediction on new data.
Input-output model: Economic model that tracks how activity in one sector creates derivative effects in other sectors.
ISP (Internet Service Provider): Company that provides internet connectivity to individuals and businesses.
Latency: The time delay from a user sending a request to the response is received; measured in milliseconds (ms).
Load balancer: Device that distributes incoming traffic across multiple servers to avoid congestion and ensure high uptime.
Load-shifting: Moving non-critical calculations to times with lower electricity prices or lower grid load.
LULUCF: UN category for discharges/storage from land use, forestry and agricultural land.
MW / MWp / MWa: Megawatt – unit of power. *MWp* indicates the maximum DC output under standard test conditions, *MWa* the AC power actually supplied to the power grid.
On-premise (On-prem): Servers and IT operations located "at home" in their own premises instead of in the cloud/data centre.
Surplus heat: Heat that servers give off during operation – can be reused in district heating, greenhouses, etc.
PPA (Power Purchase Agreement): Long-term contract where a buyer purchases power from a specific renewable energy plant at a fixed price
Power Usage Effectiveness (PUE): Ratio of a data centre's total power consumption to the portion that goes directly to the servers – the closer to 1, the more efficient
PUF infrastructure: Redundant power supply lines for *Power, Utilities & Fiber* (power, water/cooling, fiber), prepared before buildings (e.g. data centre) are constructed.
SMEs: Small and medium-sized enterprises (10–249 employees according to EU definition).
UPS (Uninterruptible Power Supply): Battery backup that provides instant power in the event of a failure, allowing servers to continue running or shut down safely.
Renewable energy (RE): Energy from sources that renew themselves naturally, e.g. wind, solar and hydropower.

01

Digitalisation

Data centres constitute the backbone of modern digital society and support Denmark's competitiveness

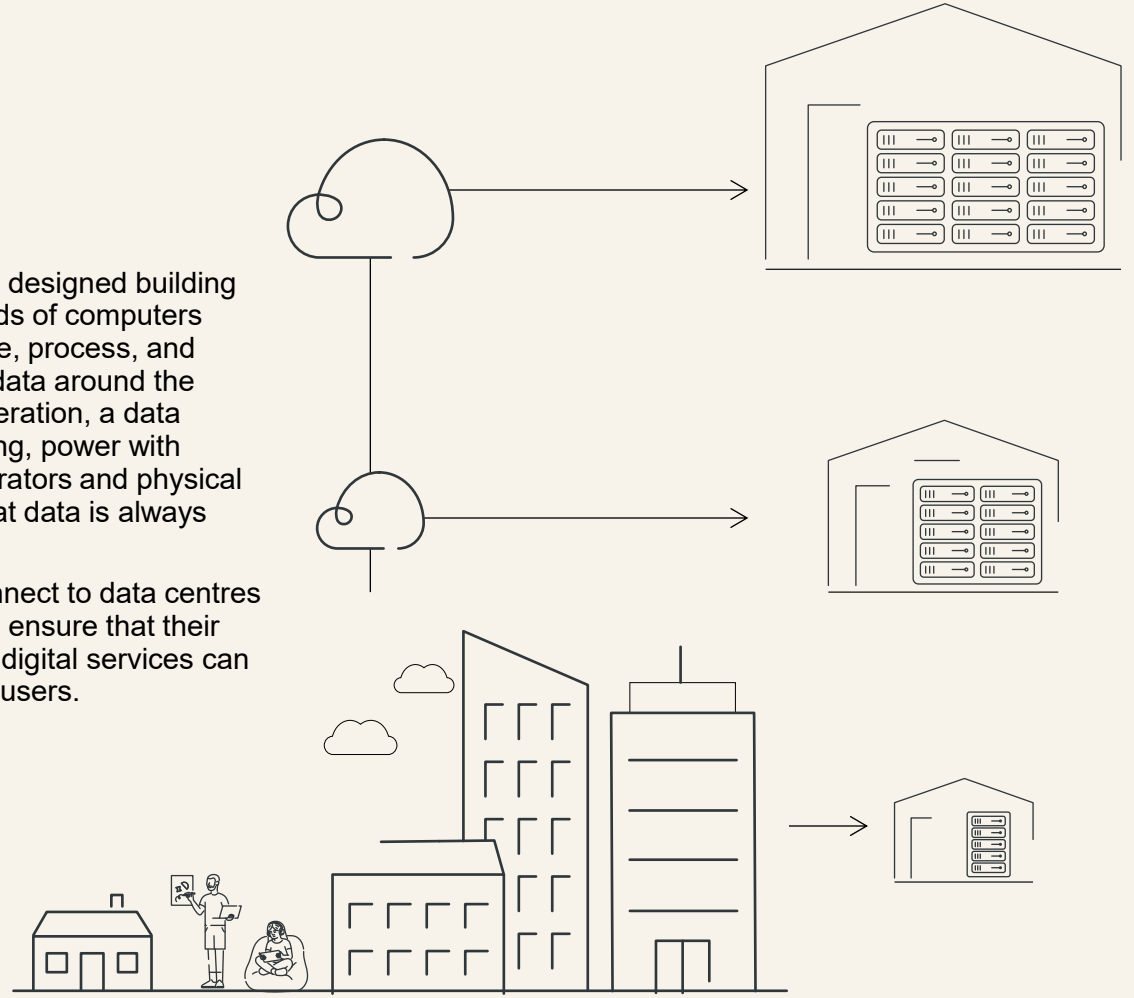
> More large data centres are crucial for us to be able to further power Danish innovation and the use of the technological solutions of the future. They create the digital foundation that our companies, researchers and authorities need to be able to exploit the potential of artificial intelligence and secure Danish positions of strength in global competition.
>
> **Caroline Stage, Minister for Digitalisation, in Børsen**

Data centres are facilities that store, process, and distribute data in real time

What is a data centre?

A data centre is a specially designed building or room filled with thousands of computers (servers) that together store, process, and transmit large amounts of data around the clock. To ensure stable operation, a data centre has advanced cooling, power with backup batteries and generators and physical and network security so that data is always available and protected.

Businesses of all kinds connect to data centres via high-speed networks to ensure that their operations and all types of digital services can run quickly and reliably for users.

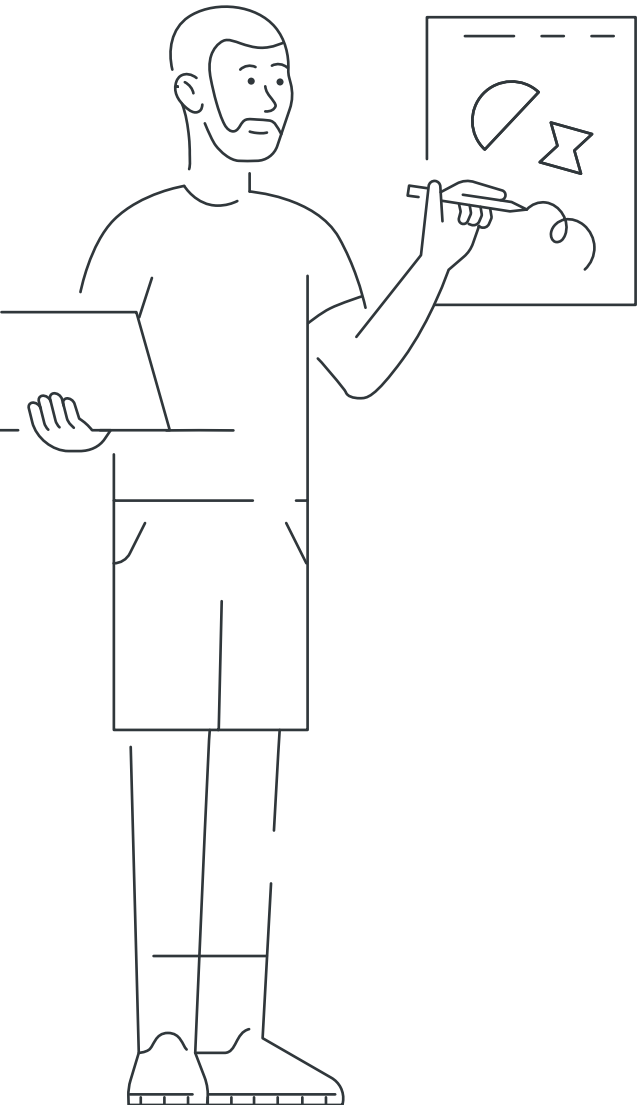


Hyperscale data centres
Hyperscale data centres are extremely large, modular facilities designed to handle massive amounts of computing and storage with high energy efficiency. They are typically owned by global technology companies and optimised for scalability, redundancy (error-proofing), efficiency and low operating costs through standardised server and network modules.

Colocation data centres
Colocation data centres offer physical space, power, cooling and network connectivity to multiple independent customers who bring and maintain their own IT equipment. This model gives businesses the flexibility to take advantage of professional infrastructure and redundancy without having to invest in and operate the entire facility themselves.

Enterprise data centres
Enterprise data centres are in-house facilities owned and operated by large organisations, tailored to support their own business-critical systems and applications. They focus on high security, aligned capacity, and compliance with industry standards to ensure control over data, performance and reliability.

A person in Denmark is connected to multiple data centres every day – from payment services to social media



A person in Denmark uses data centres in their everyday life when they...

Check the weather forecast
Live outlooks and radars are generated and stored in data centres and cloud backups.

Make payments
Payments go through servers in data centres, which confirm the transaction in seconds.

Plan their transport
Route planning and real-time data are processed in data centres, so users can get up-to-date public transit departures and live traffic information.

Stream music
Audio files and recommendations are delivered from edge nodes (server close to the user) that mirror the content from major European data centres.

Use email and participate in virtual meetings in the office or from home
Mail, documents and video meetings run in Danish data centres, which provide low latency and local data storage.

Upload photos to the cloud
The photos are uploaded to servers in a data centre, where they are copied to multiple locations to avoid loss.

Watch a series in the evening
The video is located in data centres, which send it in small chunks to the user's screen so that the image does not lag.

Shop online
Cart, stock and delivery times are handled by small, auto-scaling services in Danish colocation data centres.

Start charging an electric car
A smart app queries in a data centre about available chargers and logs the consumption for billing.

Use social media
Images, videos and updates are streamed in real time from data centers that curate users' feed and deliver content directly to their screen.

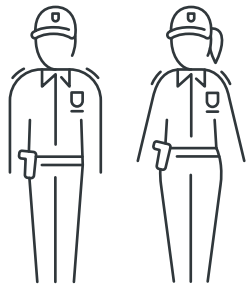
Source: Implement Economics based on Google, Netflix, Dgtl Infra, ComputerWorld, and Microsoft,

Data centres enable many of our society's everyday functions

Data centres in Denmark support...

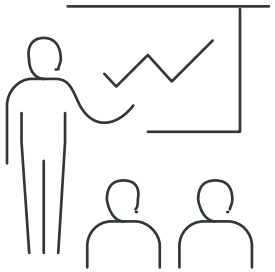
Health care

Data centres enable quick access to electronic health records, cloud-based imaging and a stable telemedicine capability that includes video consultations and home monitoring, so doctors and nurses can diagnose, treat, and follow remote patients safely and efficiently.



Police and emergency services

Data centres support emergency call handling, live storage and streaming of public-area video feeds and secure evidence analysis, giving police and emergency teams real-time insights and documentation for faster response and more effective investigations.



Schools and education

Data centres enable high-uptime school communication platforms, streaming of digital learning materials, and fully scalable remote learning, allowing teachers, students and parents to collaborate and exchange materials seamlessly – both in the classroom and remotely.

Business and trade

Data centres run cloud-based e-commerce platforms, real-time inventory and logistics management, and 24/7 customer data services, helping businesses streamline operations, enhance customer support and maintain continuous growth.

Public administration

Data centres enable online self-service of public services, centralised protection of tax and passport data, and GDPR-secure backups and operations, so citizens can confidently conduct official errands digitally while governments comply with legislation and ensure data integrity.

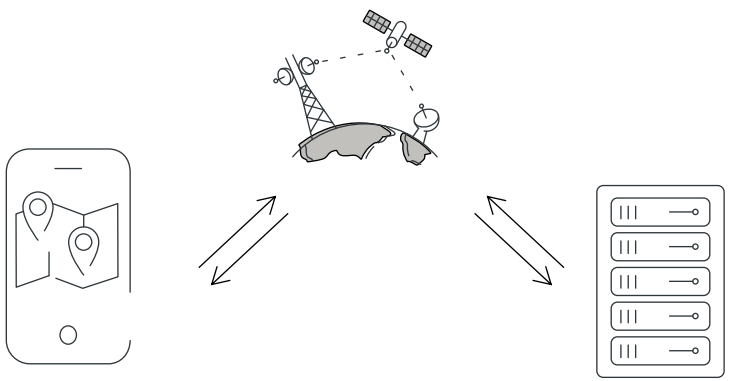
Behind fast and stable digital services lies a network of advanced data centres that run around the clock and deliver data with minimal latency

1 User and device

The consumer uses a digital service, e.g. social media, card services, or an AI chatbot.

2 Local Area Network & ISP

The request first hits the local ISP's equipment, and then the request is translated into an Internet Protocol (DNS) address, so it knows where to go.

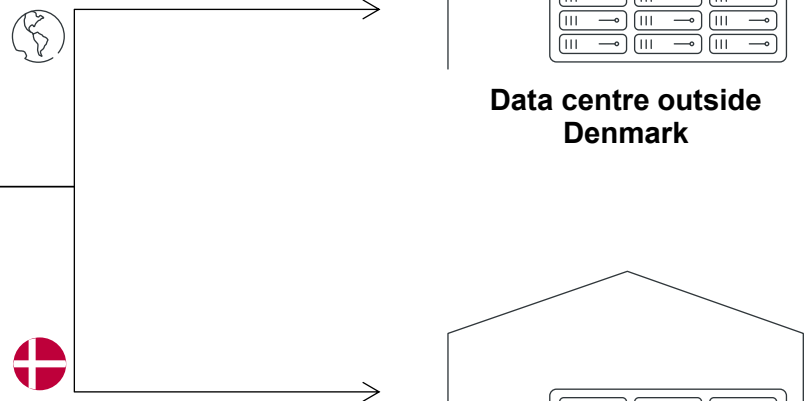


3 Edge node/CDN

The request is sent to an *edge node*, i.e. a geographically "local" server that already has many elements locally.

4 Network *backbone*

If the edge node does not have the necessary data, the request is passed on to the backbone of the internet: a network of high-speed fibre connections that connect data centres globally. Intelligent routing chooses the most efficient route to the data centre that is closest or best suited to process the query.



Data centre outside Denmark

Data centre in Denmark

5 Data centre treatment

When the request reaches the data centre, it goes through the following steps before a response is sent back to the user:

1. **Firewall and cyber security:** The traffic is checked for malware and unauthorised queries before it reaches the servers.
2. **Distribution**: A *load balancer* sends requests to different servers to avoid congestion and ensure availability.
3. **Application/Web servers:** Here the request is processed, the user's identity is checked and the content is calculated.
4. **Data pipeline & processing:** Data is collected, validated, and cleaned of errors in a data pipeline.
5. **Databases and storing:** User data is stored in databases, large files are placed in another storage, and backups are taken continuously.

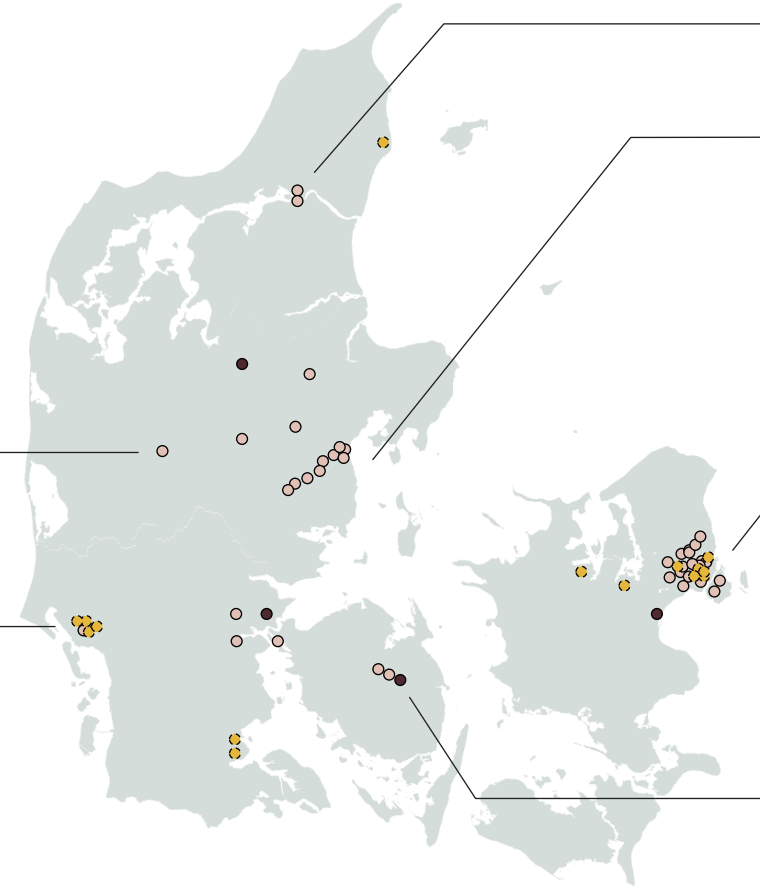
6 Reply back

Denmark's 49 data centres are spread throughout the country, and several new data centres are being built or planned

- Hyperscale data centre
- Colocation data centre
- Under construction or planned

74%

of the data centre *capacity* in Denmark is located in Jutland and Funen



Central Jutland

Colocation
- DLX.dk, Herning
- JN Data, Silkeborg

Hyperscale
- Apple Data Centre, Tjele

West Jutland

Colocation
- Bulk Infrastructure DK01, Esbjerg Ø

North jutland

Colocation
- Netic, Aalborg
- Netic, Aalborg

East jutland

Colocation
- Cibicom, Aarhus
- Cibicom, Hinnerup
- Fuzion, Skanderborg
- Fuzion, Aarhus
- Fuzion, Randers
- GlobalConnect, Skanderborg
- GlobalConnect, Hørning
- GlobalConnect, Kolding
- ITM8, Aarhus
- ITM8, Aarhus

Hyperscale
- Google, Fredericia

Greater Copenhagen / Zealand

Colocation
- Adeo, Albertslund
- Aeven, Søborg
- Atlasedge, København S
- Cibicom, Højbjerg
- Cibicom, Ballerup
- Cibicom, Smørum
- Digital Realty, Ballerup
- Digital Realty, Viby
- DXC, Valby
- Fuzion, Copenhagen
- GlobalConnect, Herstedsvang
- GlobalConnect, Vesterbro
- GlobalConnect, Taastrup (x4)
- Kyndryl, Brøndby
- KMD, Ballerup
- KMD, Søborg
- Stack EMEA, København S
- Penta Infra, Glostrup
- KMD, Ballerup
- KMD, Skovlunde
- ITM8 Valby
- I2, Risø
- I2, Lyngby

Hyperscale
- Microsoft, Køge
- Microsoft, Roskilde
- Microsoft, Høje Taastrup

Funen

Colocation
- GlobalConnect, Odense
- Unit IT Force, Middelfart

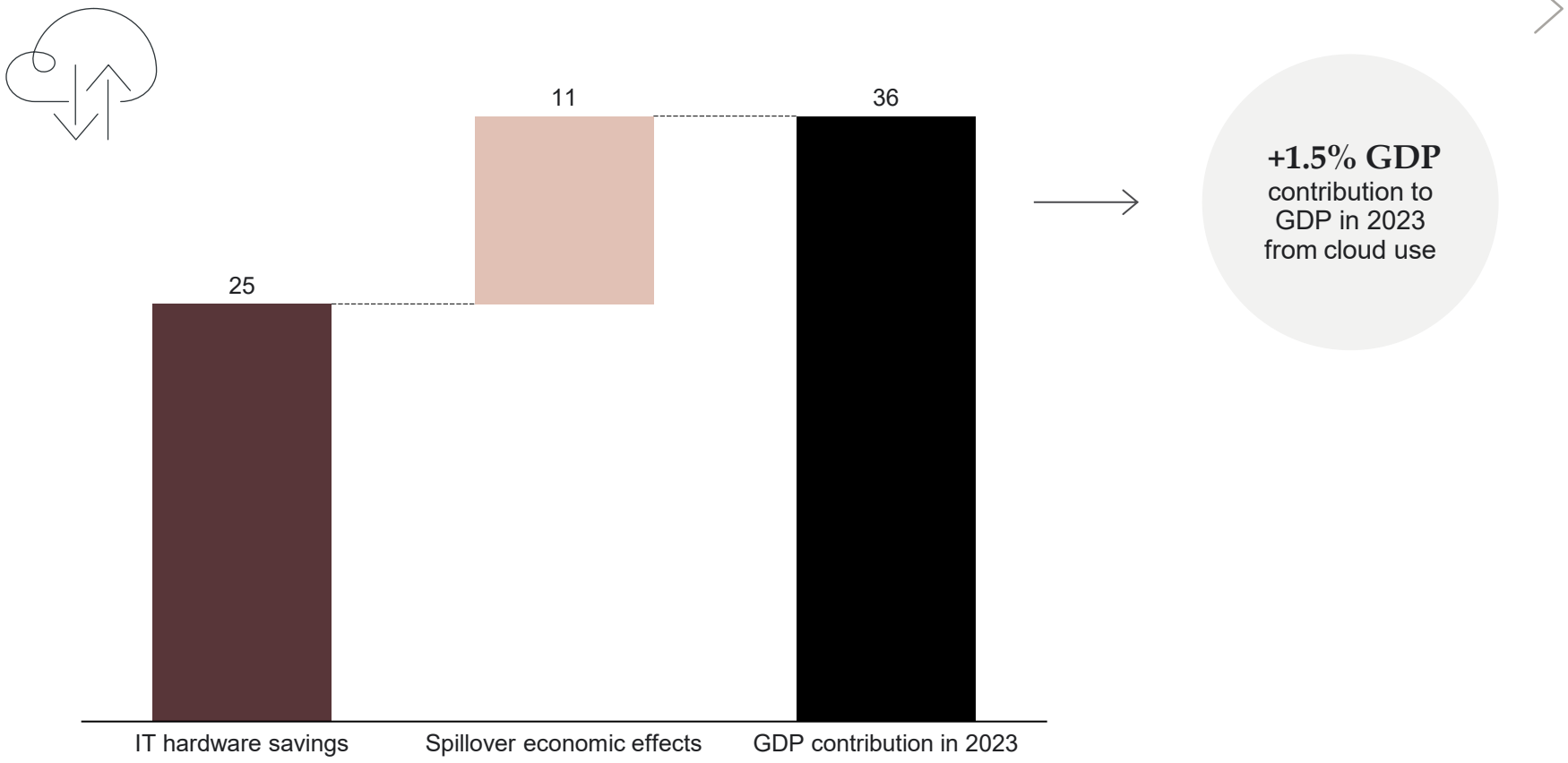
Hyperscale
- Meta, Odense

There is uncertainty about the exact extent of deployed data centres in Denmark.
Source: Implement Economics based on the Danish Data Center Industry.

Data centres are crucial for the use of cloud, which supports a GDP contribution of DKK 36 billion

GDP contribution from cloud, 2023

DKK billion



+1.5% GDP contribution to GDP in 2023 from cloud use

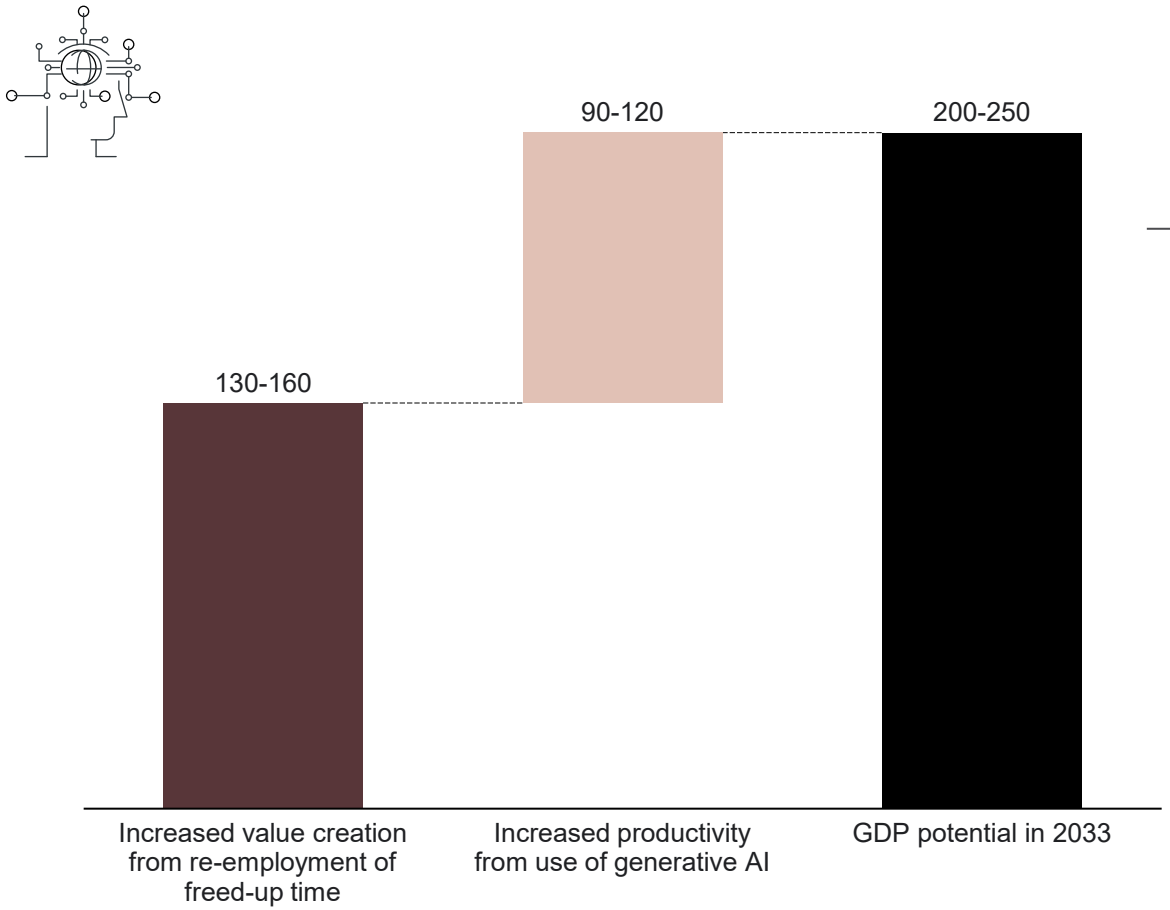
- Cloud is a broad term for a number of internet-based IT solutions such as data storage, server capacity and software.
- Where software was previously installed and operated on one's own servers, cloud enables these systems and data to be moved to data centres from which they can be accessed online.
- Among the benefits of cloud are scalability, high energy efficiency, access to new AI tools and an overall high level of security.
- In practice, this means that users can access programs, files and data via the internet instead of having them installed and stored on their own computers.
- Data centres are thus a direct prerequisite for cloud services, and 66% of Danish companies have adopted cloud.
- Telecom Advisory Services (TAS) estimates that cloud usage contributed approximately DKK 36 billion to Danish GDP in 2023.
- Historically, productivity increases in the Danish economy have led to increased prosperity and higher wages in the labour market.

Note: TAS quantifies the GDP contribution of Cloud globally and in countries, including Denmark, with a structural simultaneous equation model where cloud adoption and AI are included as factors in total factor productivity, and the parameters are estimated via 3-Stage Least Squares (3SLS) with country- and sector-specific fixed effects to quantify cloud computing's contribution to GDP.
Source: Implement Economics based on TAS and McKinsey.

Data centres and cloud are essential for the adoption of artificial intelligence, which constitutes a productivity potential of 8% of GDP at widespread adoption

Productivity potential of AI

DKK billion



+8% GDP
annual potential of widespread adoption of generative AI

- AI (artificial intelligence) refers to systems and algorithms that can perform tasks that have traditionally required human intelligence.
- Generative AI is a form of AI that does not simply analyse or classify data but independently creates new content (text, images, or sound) by learning patterns in large amounts of data.
- AI models require vast amounts of data and computing power. This support is provided through cloud solutions and data centres, which enable efficient data storage and high performance when training and deploying models.
- Widespread adoption of generative AI in Denmark could unlock an annual economic potential of up to DKK 250 billion, corresponding to an 8% contribution to GDP.
- The benefits of generative AI in Denmark consist of freed-up time and increased productivity in existing tasks that can be performed faster and with higher quality.

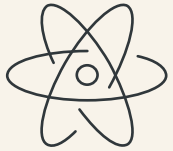
Source: Implement Economics has quantified the potential of AI in Denmark in *The economic opportunity of generative AI in Denmark*.

Cloud data centres and AI will be essential for the development and use of future quantum computers, which can provide major competitive and societal benefits

Data centres are crucial for realising the potential of **cloud** and **AI** for society and companies. Looking ahead, they will be crucial for the benefits associated with the use of **quantum computers**.

Danish companies and the state can reap competitive advantages from a leading quantum computing industry in Denmark

Possible application potentials



Quantum modelling
Quantum computers can mimic how molecules and materials behave. This makes it possible to obtain more precise results, which can lead to e.g. new drugs and better materials.

Cryptography
Quantum computers can both break the encryption we use today and help develop stronger, future-proof methods of protecting data.

Combinatorial optimisation and machine learning
Quantum computers can more quickly find good solutions to difficult tasks in logistics, planning and data analysis by utilising quantum states.

Climate modelling
Quantum computing can make more accurate forecasts of the weather and climate, so that we can better understand and combat climate change.

Denmark has a strong platform to position itself within quantum computing

1. Institutions such as the Niels Bohr Institute and DTU have long set the global agenda in quantum physics.
2. The Danish government's quantum strategy commits over DKK 1 billion through 2027 to support research and commercialisation.
3. Global players like Microsoft are investing heavily in Danish materials research to build scalable quantum computers in collaboration with local experts.
4. The Novo Nordisk Foundation is backing a 12-year programme to deliver a fully functional quantum computer by 2034—and to develop life-science applications.

Source: Implement Economics based on Innovation Centre Denmark, Microsoft, the Novo Nordisk Foundation, DTU and Innovation Fund Denmark.

Modern data centres ensure the best cyber security in Danish businesses and public institutions

SAS Institute

77% of government leaders listed data security as a concern in the use of generative AI in a global survey

In most cases, the CSP can secure the services being provided to the SME much more effectively and efficiently than the SME. [...] Moving to cloud based patch management and cloud based anti-virus platforms can provide the SME with the capability to ensure that their IT infrastructure is being managed and secured.

European Union Agency for Cybersecurity (ENISA) in *Cybersecurity for SMEs (2021)*

Properly implemented cloud technology can improve speed of delivery, increase security and create opportunities for organisations to innovate. Government organisations and functions need to work together more effectively across functions to take full advantage of these benefits.

Government Digital Service (UK) in *Cloud guide for the public sector (2023)*

Cloud computing offers a range of potential cyber security benefits for cloud consumers to leverage, providing access to advanced security technologies, shared responsibilities, fine-grained access management, comprehensive monitoring and highly redundant geographically dispersed cloud services. For many organisations, cloud computing can provide significant improvements to their cyber security, mitigating the risk of many current cyber threats.

Australian Cyber Security Centre in *Cloud assessment and authorisation (2024)*

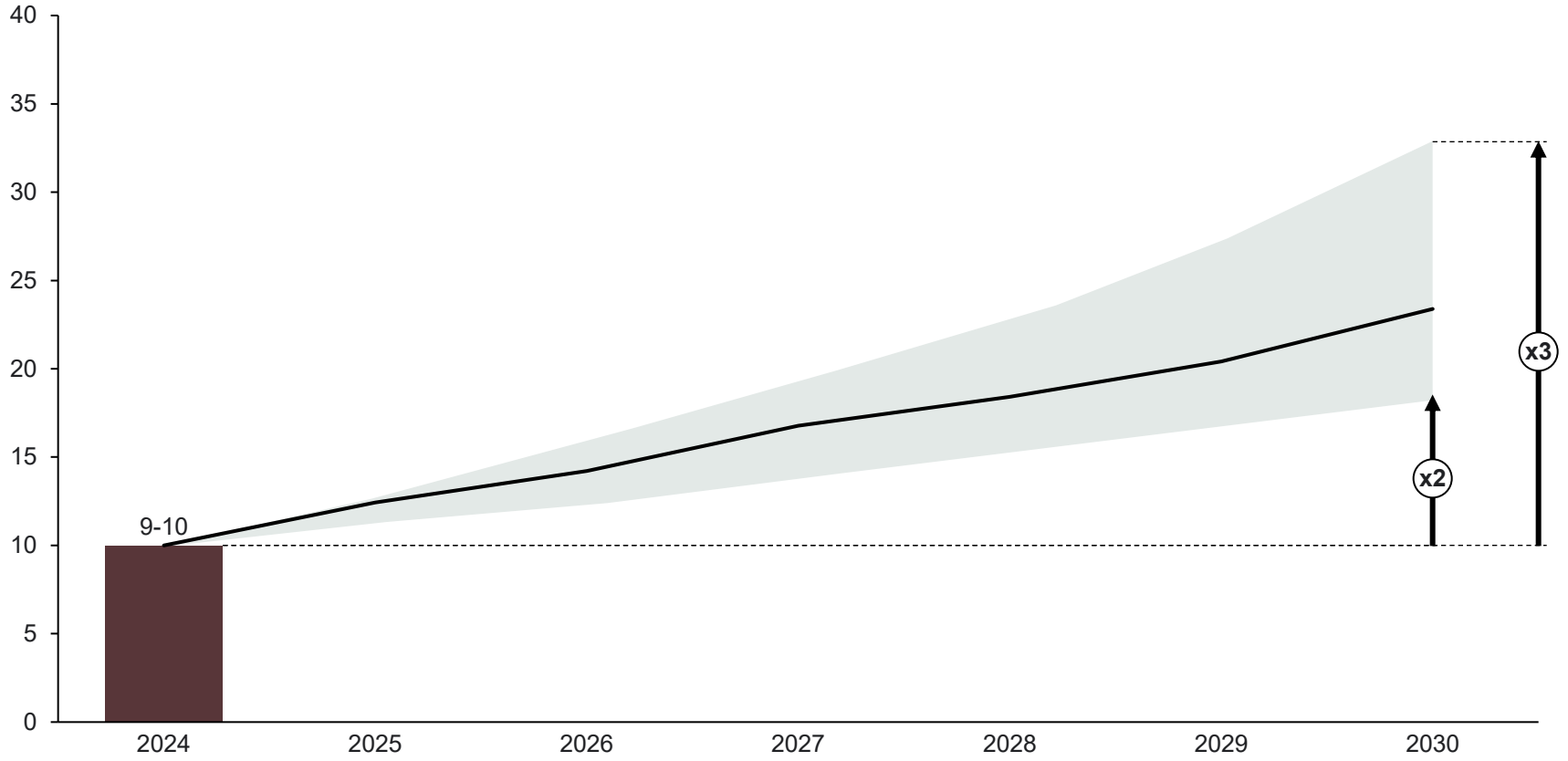
- Modern data centres are protected against a range of hybrid threats, including attempts by foreign powers to gain strategic advantages through cyber attacks.
- In addition, data centres are physically secure facilities with measures such as security guards, which protect against physical threats to which on-premise servers are less resilient.
- In September 2024, the Danish Defence Intelligence Service's Centre for Cyber Security assessed that the threat from cyber espionage and crime is very high, and a survey by the Danish Chamber of Commerce shows that security level is the most important factor for most companies when choosing a cloud provider.
- IBM reported that organisations that implemented AI solutions for security and automation saved an average of about DKK 15 million in one year.
- Modern data centres, including cloud solutions, offer the best cyber security for Danish companies and institutions, and multiple international bodies recommend cloud for this very reason.

Source: Implement Economics based on the Danish Agency for Societal Security, ENISA, the Danish Chamber of Commerce, the National Cyber Security Centre, the Australian Cyber Security Centre, ENISA and the National Cyber Security Centre.

European data centre capacity needs to increase significantly to ensure competitiveness and meet future needs, especially those arising from AI

Installed IT capacity in Data centres in Europe

GW



- Analysts expect Europe's data centre capacity to double or even triple by 2030 to meet future demand, with 25-30% of capacity allocated to AI compared to less than 5% today.
- According to the European Commission, however, projections indicate a gap between available capacity and what is needed, especially to meet AI-driven demands.
- In addition, Europe's data centre industry is expected to fall behind the United States and China by 2030.
- The expansion of data centre capacity in Europe also contributes to digital sovereignty, i.e. a digital ecosystem of control, choice and security in Europe.
- If Europe fails to scale up data centre capacity to meet demand, its companies risk falling behind regions where capacity is expanding significantly, which could hinder innovation, economic growth and job creation.

Note: There is uncertainty about the exact capacity in European data centres, which varies between 8.5 and 10 GW in capacity. The annual capacity growth for each forecast is made comparable by plotting from a common current capacity level.
Source: Implement Economics based on Draghi, the European Commission, Statista, IEA, ICIS, Mordor Intelligence, Goldman Sachs, IDC, Financial Times and McKinsey.

02

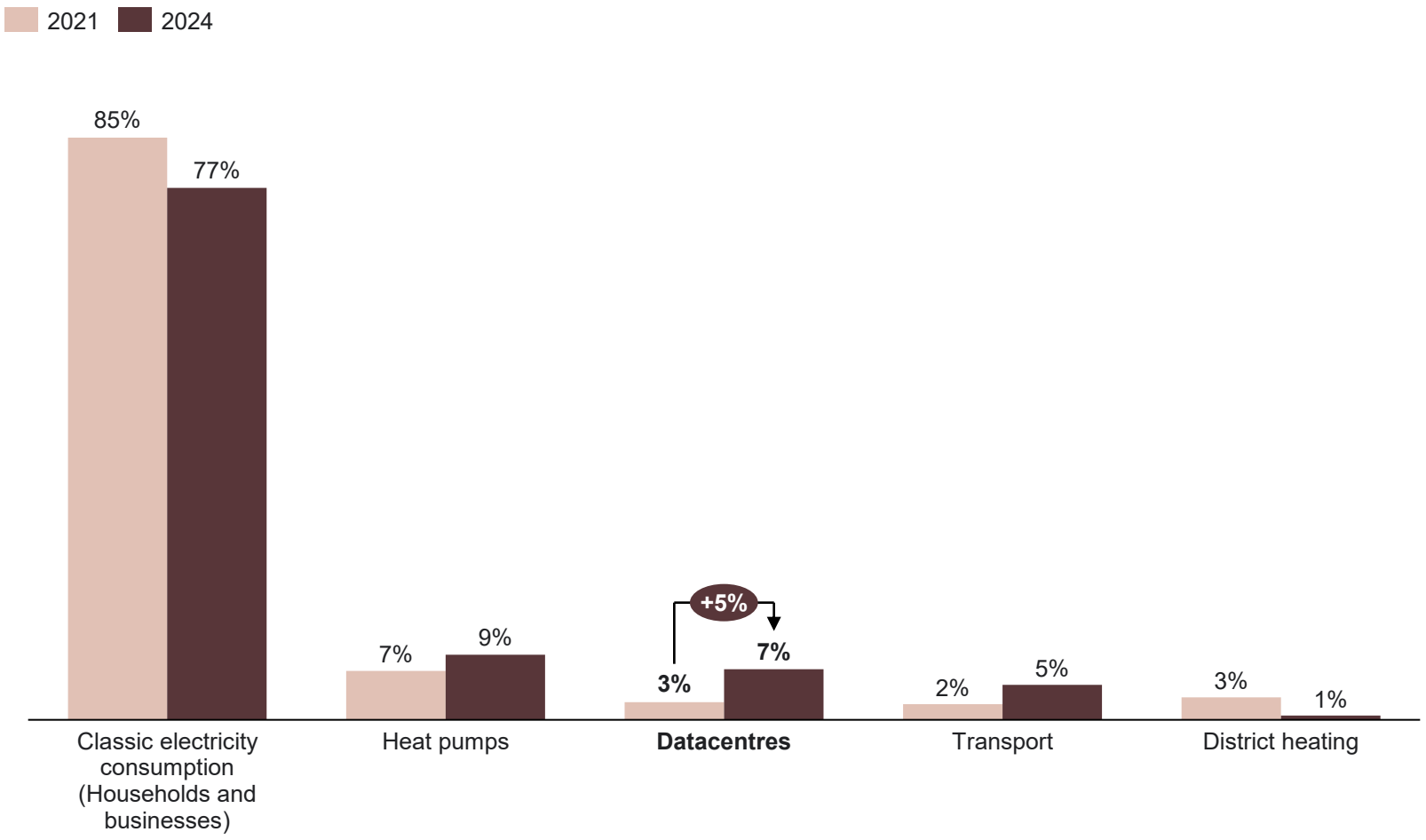
Green transition

While data centres are inherently energy-intensive, the industry plays a pivotal role in Denmark's green transition by making massive investments in renewable energy.

Data centres use large amounts of electricity to meet the increasing demand for digitalisation and AI, and their share of Denmark's electricity consumption has increased to 7%

Electricity consumption

% of total Danish electricity consumption



- The data centre industry is energy-intensive. According to the Danish Energy Agency, its proportion of total electricity consumption has risen from 3% in 2021 to 7% in 2024.
- The increase in electricity consumption reflects the increased digitalisation in Danish society and the increasing demand for e.g. AI and cloud.
- Compared to other energy-intensive sectors, the data centre industry is a relatively easy-to-abate sector[1].Meanwhile, data centres are investing in and supporting the green transition:

The industry invests significantly in renewable energy and has established renewable energy capacity of at least 560 MWp, *see p. 24*.

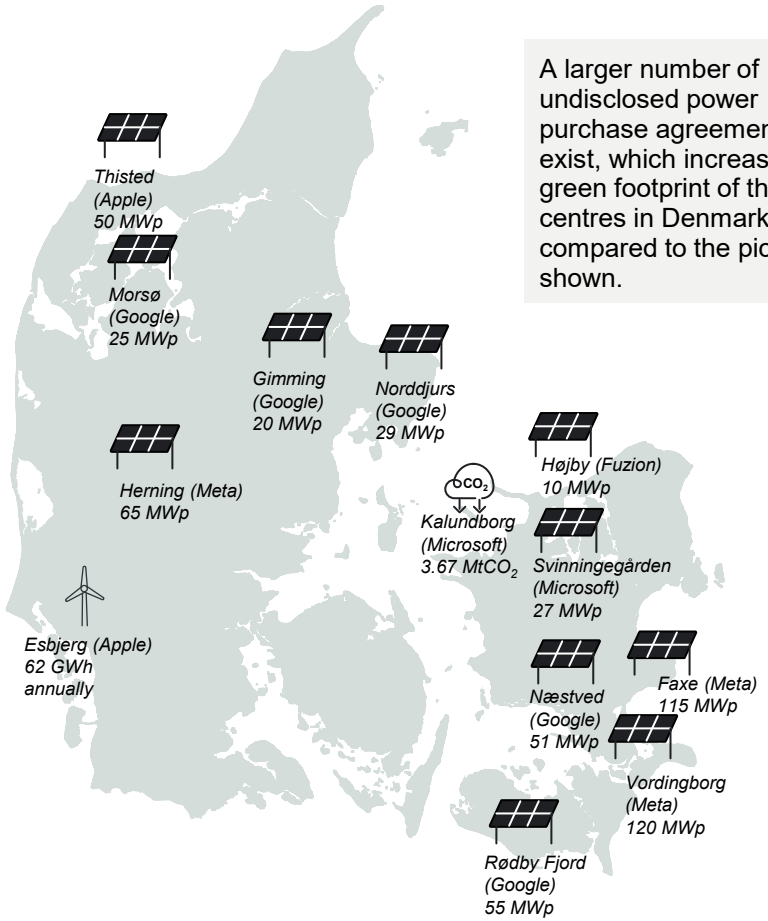
In addition, large data centre operators are developing innovative solutions and agreements to strive for green power consumption in their operations, *see p. 25*.

Data centres are also crucial for supporting digital technologies that can achieve CO_2 reductions in line with the government's target of a 70% reduction by 2030, *see p. 26*.

Note: 1) The majority of data centres' CO_2 emissions come from electricity consumption (Scope 1 and 2), which can be covered by mature and cost-effective solutions such as green power purchase agreements, on-site solar/wind and advanced cooling. In contrast, heavy industries such as steel, cement and chemicals require expensive and technically challenging rebuilds of high-temperature processes and unfinished technologies such as hydrogen reduction or CCS.
Source: Implement Economics based on the Danish Energy Agency, EEA and the Danish Data Center Industry.

Data centre operators invest heavily in renewable energy and have added at least 560 MWp of additional renewable capacity to the Danish power grid

Long-term power purchase agreements between data centre operators and renewable energy parks



A larger number of undisclosed power purchase agreements exist, which increases the green footprint of the data centres in Denmark compared to the picture shown.

335 MW
Installed data centre capacity (2024)

+560 MWp
Installed maximum renewable capacity added additionally by hyperscale operators

- Large data centre operators in Denmark often enter long-term renewable energy power purchase agreements (PPAs) to ensure a stable, carbon-neutral power supply that meets both regulatory requirements and sustainability goals.
- Since 2019, data centre operators in Denmark have formed partnerships with green energy suppliers, totalling at least 560 MWp.
- These PPAs are inherently *additional* to the Danish electricity grid, since the renewable energy parks would not have been built without these investments.
- The added renewable energy capacity and the data centre capacity reflect the maximum *peak* power, and the realised capacity is therefore estimated to be lower.
- Additionally, Microsoft supports CCS projects in Denmark by purchasing CO_2 credits for a total of 3.67 million tCO_2 from Ørsted, who is implementing CCS technology.
- The existing portfolio of green power purchase agreements in Denmark highlights the role of data centre operators as important energy partners in the green transition.

Note: MWp indicates the maximum DC power of the solar panel under standard conditions, while MWa is the power in AC that is actually delivered to the grid.
Source: Implement Economics based on Google, State of Green, Reel Energy, Microsoft and Green Power Denmark.

Data centres create new solutions and enter into agreements to strive for a green electricity consumption

The data centre industry is an increasingly regulated industry, but several large data centre operators are setting stricter requirements for their green power consumption than regulations require.

Google sets out to match its actual electricity consumption hourly with CO_2-free sources (24/7 CFE approach). This means that when the data centre in Fredericia draws power, Google aims to add green power to the grid from wind, solar or hydropower at the same hour. The goal is that each MWh is consumed exactly at the time when renewable energy is produced, and not just "bought" annually in a single bundle of certificates. In 2023, 92% of the electricity consumed by Google's data centre in Fredericia was green.

Microsoft has set a 100/100/0 target for 2030, which means that 100% of its electricity consumption, 100% of the time, must be covered by energy with 0% CO_2 emissions. In establishing the data centre region (three data centres on Zealand), Microsoft is committed to matching all energy consumption from each data centre with 100% renewable energy purchases by the end of 2025. In addition, Microsoft plans to use an eco-labelled fuel to power its backup generators to further reduce CO_2 emissions.

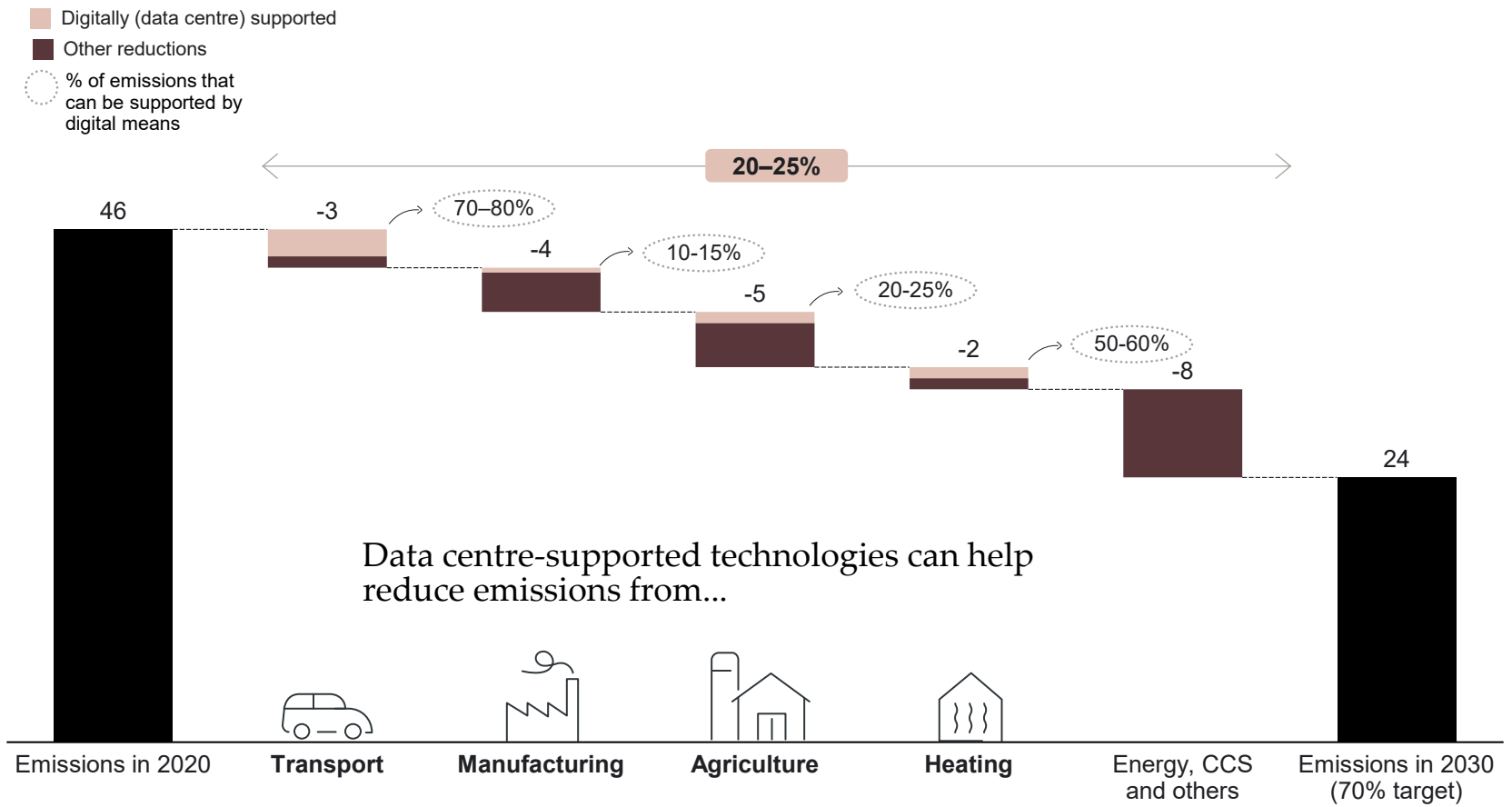
Since 2020, **Meta** has maintained net zero GHG emissions in their global operations. Meta is publicly committed to achieving net zero emissions across their value chain and becoming water positive in 2030. Meta uses European Guarantees of Origin (GOs) and retires them directly for the MWh that go to Odense on an annual basis. This provides transparent documentation that the consumption is matched by the newly renovated solar production in Denmark, and prevents the same certificates being sold to others.

Source: Implement Economics based on Google, Microsoft, Meta and Apple.

Data centres enable digital technologies that can support reductions in CO_2e emissions corresponding to 20-25% of Denmark's 2030 target

Net CO_2e-emissions in Denmark

$MtCO_2e$



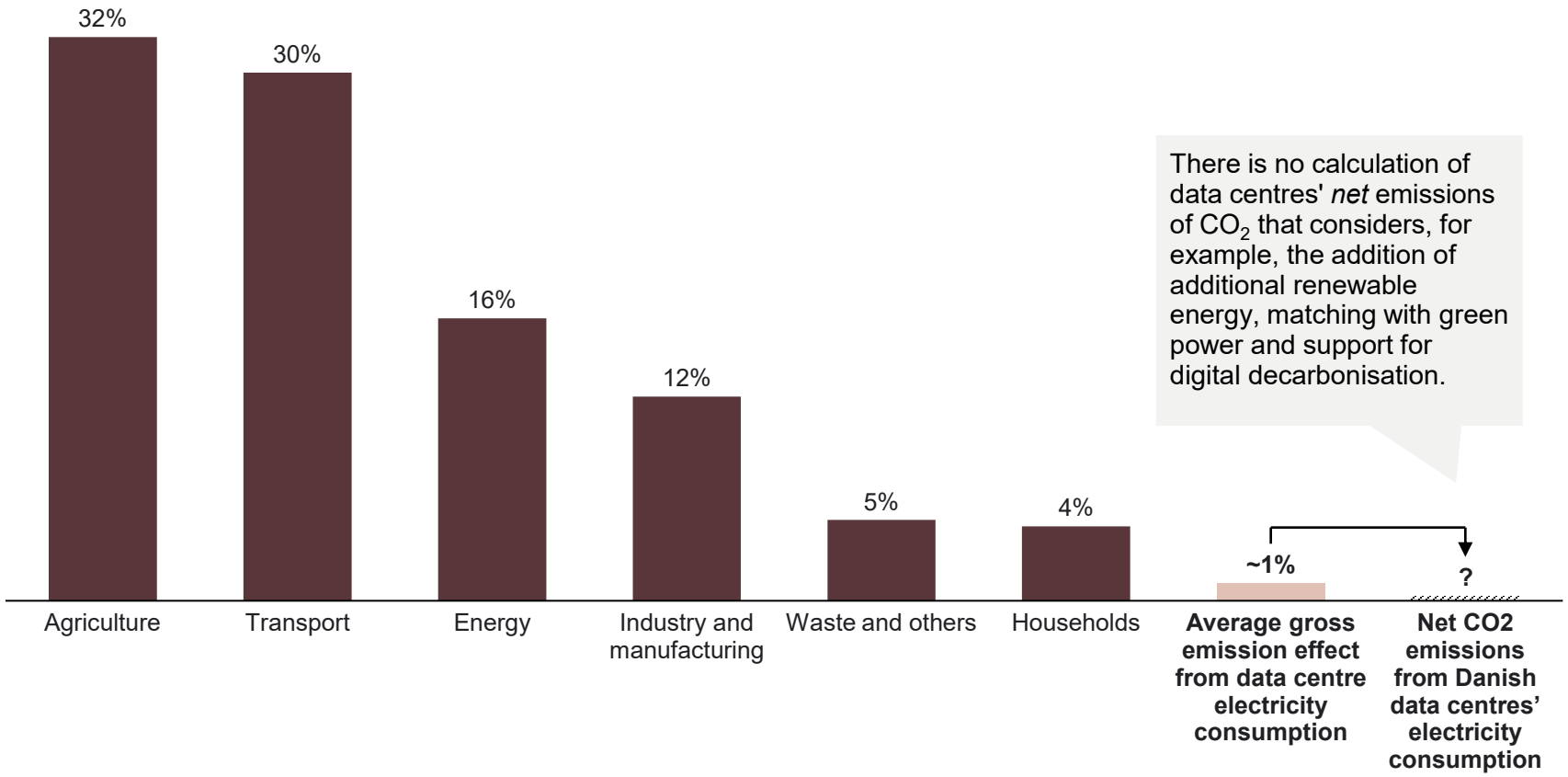
- Data centres can play an important role in the green transition by enabling digital technologies that can support 20-25% of the CO_2e reductions that Denmark must achieve to meet its 2030 target.
- The biggest gains come from supporting vehicle electrification, with data centres supplying the computing power needed to analyse charging patterns in real time and optimise EV charging management.
- In manufacturing, data centres can enable scalable computing, helping companies boost energy efficiency and reduce overproduction through more accurate demand forecasting.
- Agricultural emissions can also be reduced with data centres that handle vast satellite and sensor data, allowing machine learning models to implement environmentally friendly precision farming that reduces, for example, fertiliser use.
- In heating, data centres can power advanced simulations and building operations management, enabling digital management systems to make buildings smarter, improve performance and unlock significant energy savings. Additionally, data centres' surplus heat can feed into the district heating network (see p. 34).

Note: Agriculture' includes emissions from agriculture and LULUCF. 'Other' includes emissions from waste.
The results are based on a study conducted by Implement in 2023. New projections from the Ministry of Climate, Energy and Utilities show reductions towards 2030 in sectors that require more support from digital technologies (e.g. transport and heating) than the path shown in this report.
Source: Implement Economics based on the Danish Council on Climate Change, the Danish government and Malmodin and Bergmark.

Despite their high electricity consumption, the operation of data centres in Denmark only accounts for a small share of the total CO_2 emissions

CO_2e-emissions in Denmark

% of total emissions in Denmark (2023)



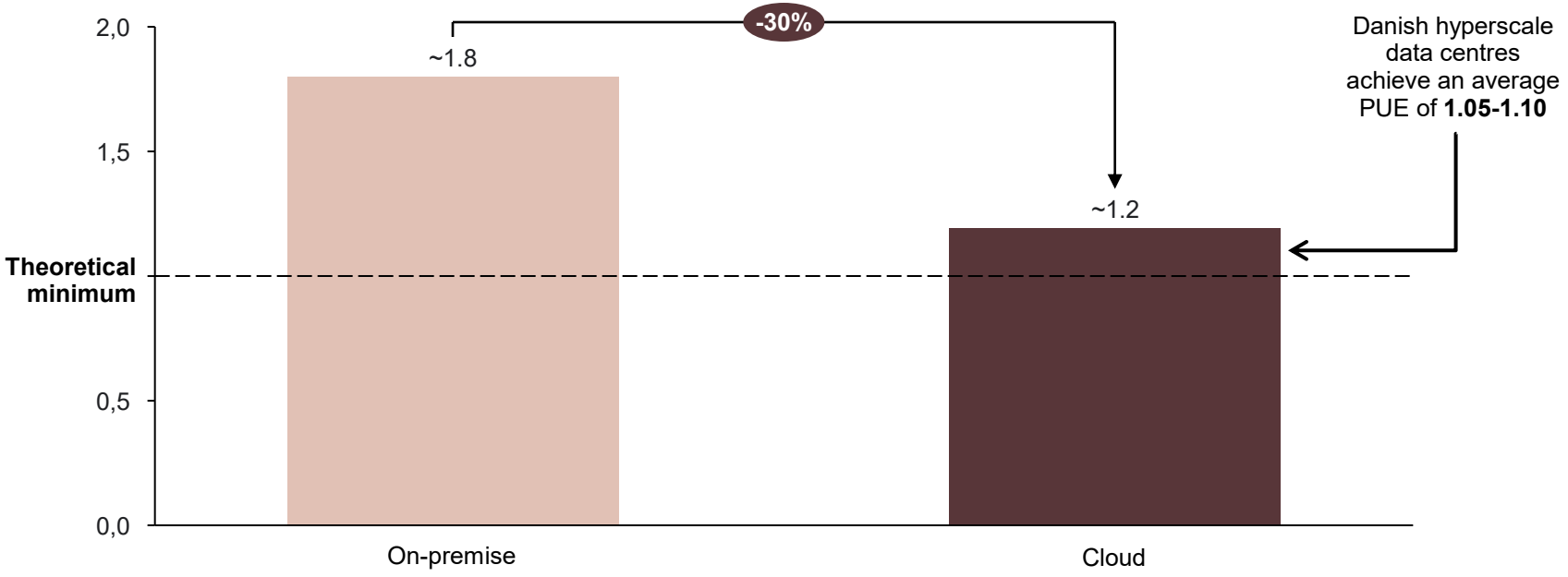
- Based on the average CO_2 intensity of electricity consumption in Denmark, the data centre industry's CO_2 emissions accounted for 1% of total Danish emissions in 2023.
- However, this calculation does not consider the data centre industry's large investments in renewable energy or its matching of electricity consumption with green power (see pages 24-25).
- Overall, this means that net CO_2 emissions from the data centres' operations are significantly lower than the 1% of total Danish emissions.
- Historically, the volume of processed data has developed faster than data centres' electricity consumption. Looking ahead, hardware energy efficiency is expected to continue improving (see p. 31), making data centre operations even greener.
- Operators and regulators should collaborate to develop a methodology that more accurately reflects data centres' climate footprints, including their renewable energy investments.

Note: Average gross power output of data centre power consumption based on a CO2 intensity of electricity consumption of 0.099 kgCO_2/kWh.
Source: Implement Economics based on the Danish Energy Agency and Masanet et al. (2020).

Compared to on-premise solutions, data centres are more efficient and use less energy per data volume

Power usage effectiveness (PUE) in EMEA[1]

Factor



- Due to economies of scale (including the most efficient computer chips, see p. 31), dynamic resource allocation, AI-optimised energy consumption and continuous energy monitoring, data centres can deliver a significantly higher data-processing output for a given amount of energy than on-premise solutions.
- In the EMEA region (which includes Europe), data centres' Power Usage Effectiveness (PUE) is 30% lower than that of on-premise solutions, meaning advanced cooling and power management reduce overall energy consumption.
- In Danish hyperscale data centres, the average PUE is even lower at about 1.05-1.10.
- Data centres are also more climate-friendly in the energy-intensive use of artificial intelligence. One study estimates that cloud solutions can reduce CO_2e emissions by 94% compared to on-prem. This can be attributed to better hardware, efficiency from cooling and the renewable energy production financed by the operator in connection with the project.

Note: 1) *Power* Usage Effectiveness (PUE) is the ratio of the energy a data centre uses to the energy that actually goes into running the servers. A number of 1 means that all the power goes to running the servers.
Source: Implement Economics based on NRDC, IDC, AWS, Microsoft, Google.

Case: In Esbjerg, where there is direct access to green energy and subsea fibre cables, there are plans to increase capacity from less than 5 MW today to 500 MW in 2030

Esbjerg Municipality has a clear strategic focus on being Northern Europe's digital hub and attracting data centres through sustainable solutions and access to green electricity. A close collaboration between Esbjerg Municipality, Din Forsyning, N1, Invest in Denmark and Business Esbjerg creates an optimal framework for establishment. Esbjerg offers green infrastructure, locally planned data centre sites, international fibre connections and a strong focus on climate-friendly solutions. The municipality is therefore an obvious choice for data centres with sustainable ambitions.

Karsten Rieder, CEO Business Esbjerg

Esbjerg attracts large data centre investments due to direct access to **91% renewable energy, low latency** via subsea cables, **recycling of cooling water** and delivery of **surplus heat to the district heating network** – a setup that, together, ensures cheap operation and a green carbon footprint for data centre operators.

Esbjerg won Data Centre Municipality of the year 2025

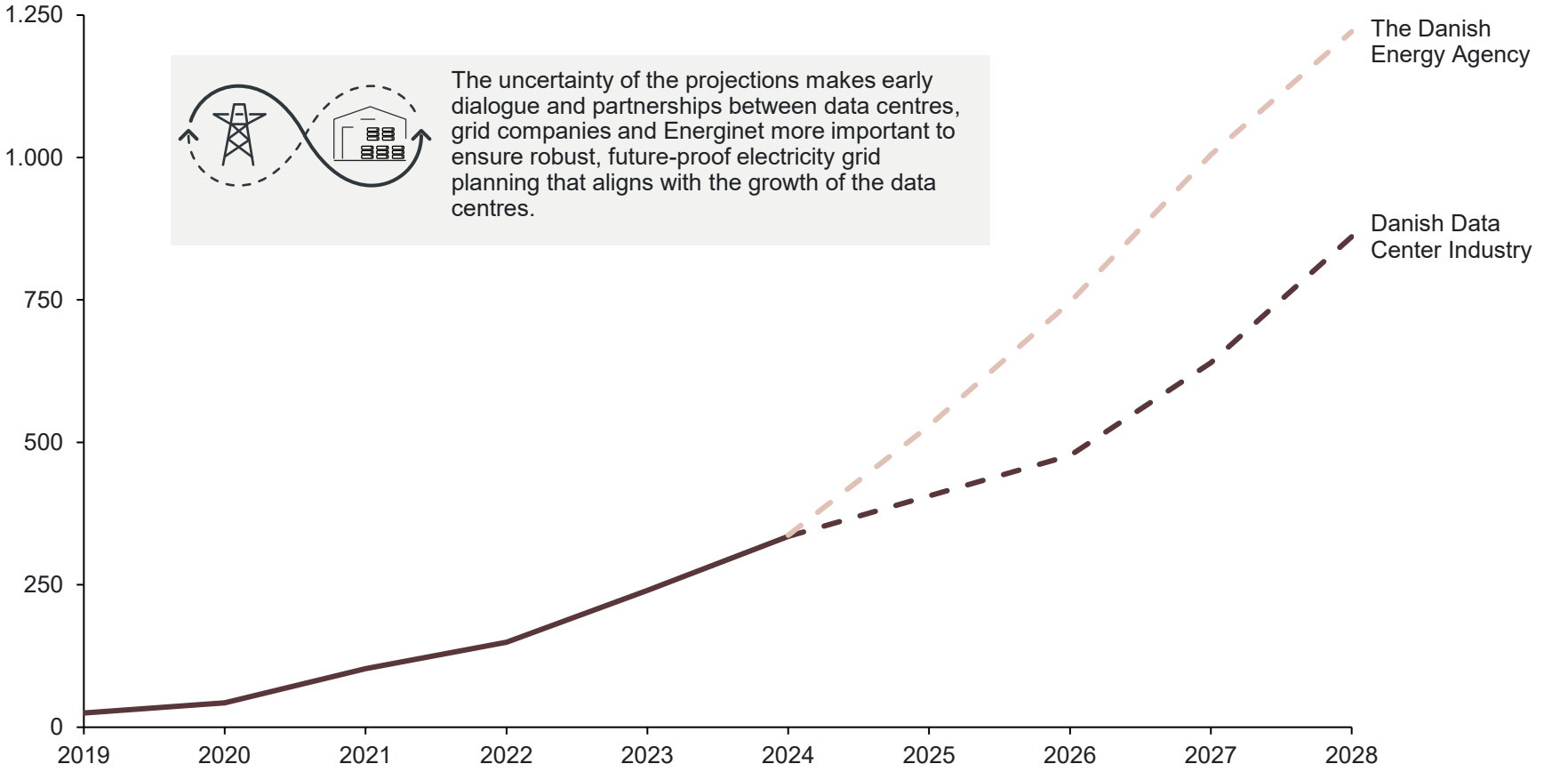
- Esbjerg is a major connectivity hub and hosts most of the subsea cables that link Europe, the UK and the US. This means, among other things, that data centres in Esbjerg have the lowest latency of any data centres in Denmark.
- Almost 450 hectares in Esbjerg are currently allocated to current and future data centres, and according to Business Esbjerg, the capacity is expected to reach up to 500 MW in 2030.
- Esbjerg offers a green profile for current and future data centres, including a goal of 100% renewable energy share by 2027. Today, Esbjerg achieves a renewable energy share in electricity consumption of 91%, and the area delivers an *overproduction* of green power of 162%.
- Esbjerg does not use drinking water to cool servers, but instead aims to recycle wastewater, which gives rise to an even greener footprint.
- Finally, data centres in Esbjerg have good opportunities to reuse the surplus heat for the district heating network depending on the location, which further reduces their CO_2 footprint.
- In May 2025, Thylander A/S announced investments of up to DKK 10 billion in a Danish-owned and -operated, scalable data centre in Esbjerg with a capacity of up to 200 MW, which will be one of the country's largest.

Source: Implement Economics based on Business Esbjerg and Børsen.

Projections of data centres' electricity consumption in Denmark are subject to considerable uncertainty and depends not only on demand but also on technology

Data centres' electricity capacity in Denmark, 2019-2028

MW



The uncertainty of the projections makes early dialogue and partnerships between data centres, grid companies and Energinet more important to ensure robust, future-proof electricity grid planning that aligns with the growth of the data centres.

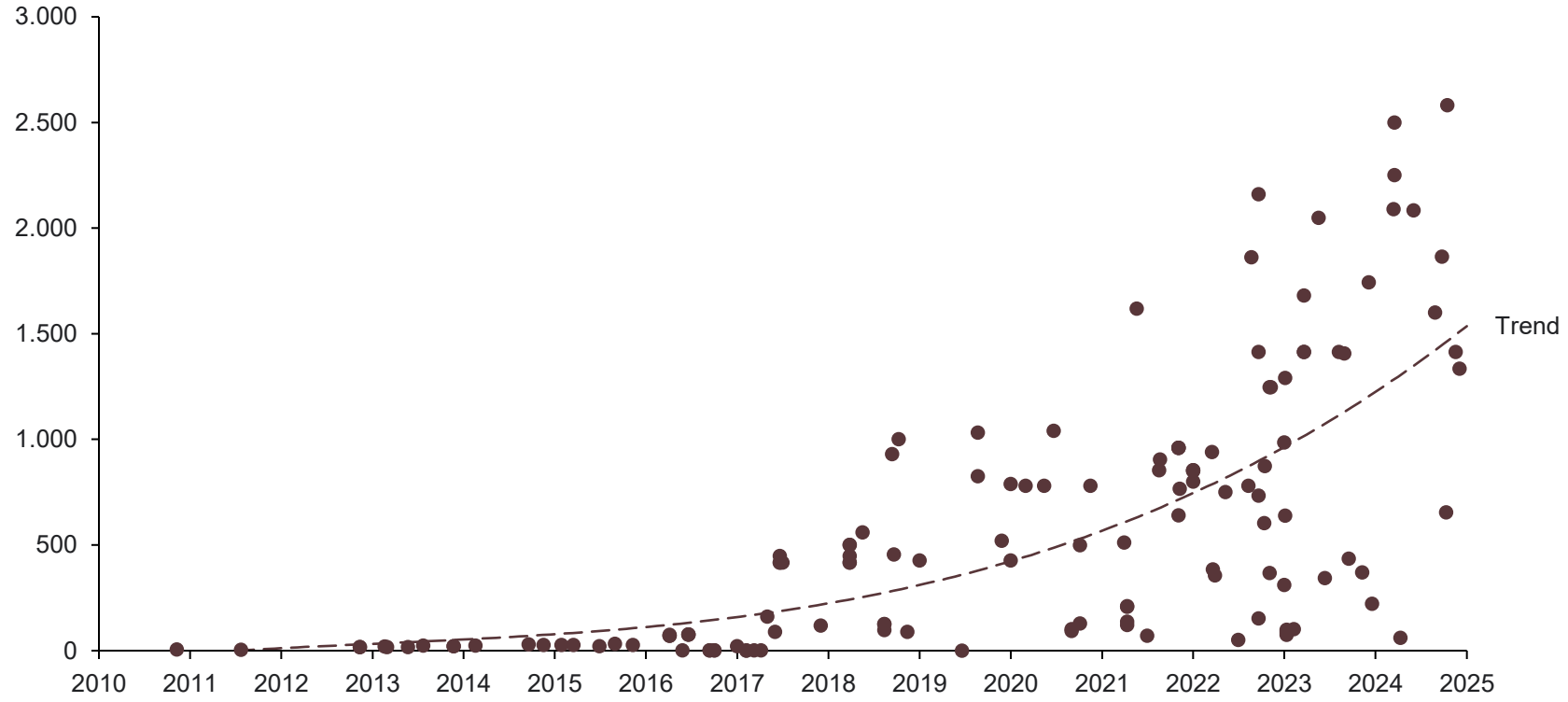
- Electricity consumption in Danish data centres is expected to rise in the coming years as more large facilities are built, and existing ones are expanded.
- The Danish Data Center Industry projects an electricity capacity of approximately 900 MW by 2028, whereas the Danish Energy Agency forecasts about 1,200 MW.
- However, comparing these projections requires a caveat: the Industry's estimate is based on installed capacity, while the Energy Agency's figure reflects reserved capacity.
- Projections of Danish data centres' electricity consumption carry uncertainties about whether and when new centres will be established in Denmark, how quickly they will reach capacity, and how AI and other technological developments may influence their electricity usage and consumption profile.

Source: Implement Economics based on the Danish Data Center Industry and the Danish Energy Agency.

Data centres' high energy efficiency requirements are a driver of innovation in hardware and computer chips

Energy efficiency in modern computer chips

GFLOPS/W[1]

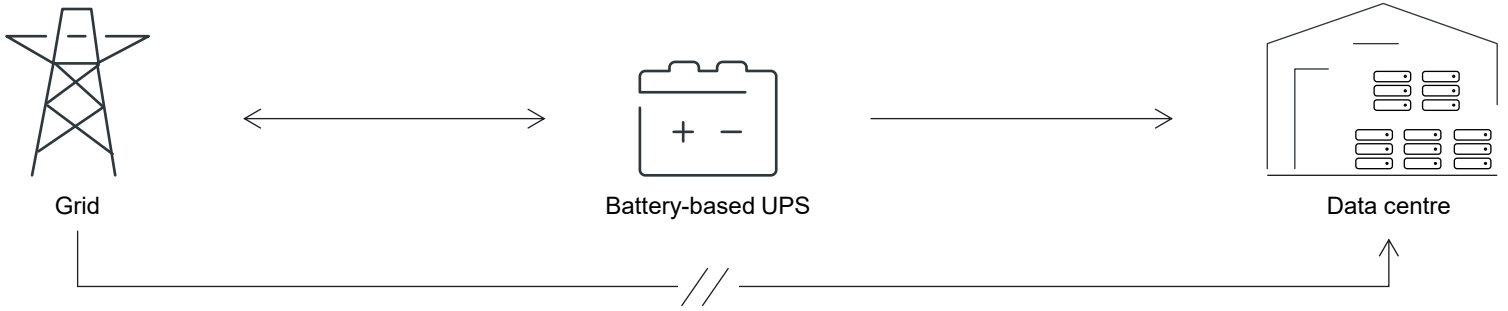


- World-leading machine learning hardware has become 40% more energy efficient every year since 2016, which is largely driven by innovation and competition from manufacturers (e.g. Nvidia, Google, AMD and others).
- However, the momentum in hardware energy efficiency can also be largely attributed to demand pressures from data centres, as more energy-efficient chips are reflected in lower operating costs and data centre operators increasingly adopt public sustainability and energy efficiency targets.
- This effect is clearly seen at Google, which – acting as both a manufacturer and a consumer – has designed a chip (Ironwood), that is 5.5 times more energy efficient than the previous generation from 2023 (TPU v5p).

Note 1) GFLOPS/W measures how many billions of floating-point operations (arithmetic calculations) a device can perform per watt of energy it uses.
Source: Implement Economics based on Epoch and Observer.

Through flexibility services, data centres can in the future contribute further to stabilising the electricity grid and increasing the share of renewable energy

Fast Frequency Response (FFR)



In situations of sudden drops in grid frequency, data centres can leverage their UPS battery to help stabilise the power grid.

FFR

Telia's data centre in Finland has integrated its Uninterruptible Power Supply (UPS) batteries with the Finnish power grid. This enables the data centre to supply capacity to Fingrid's Fast Frequency Reserve market. When the frequency drops, the centre automatically switches to battery operation in less than one second, releasing up to 6 MW into the grid. The solution does not affect operational stability and at the same time provides a new source of income.

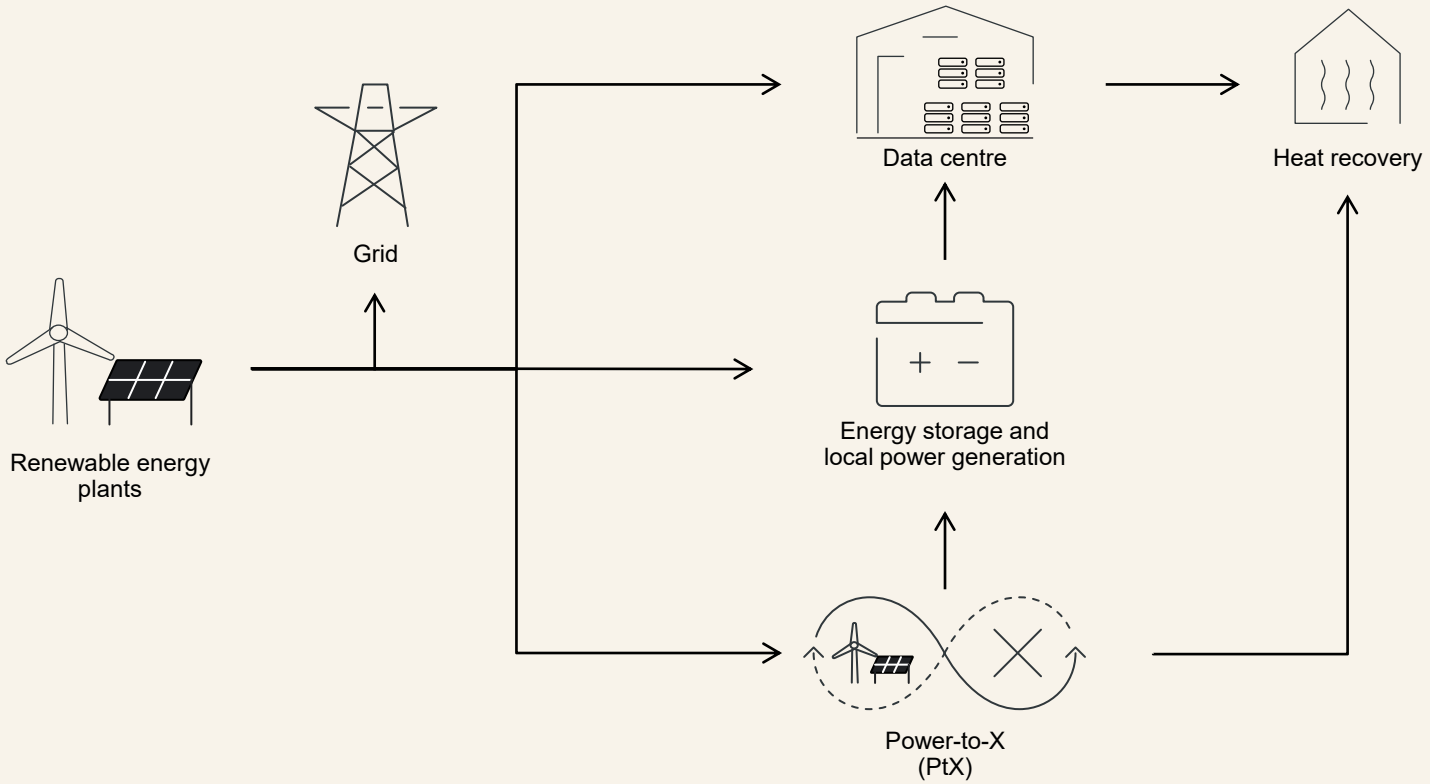
In collaboration with Schneider Electric, Aeven has developed Denmark's first FFR solution. In 2022, Aeven allocated 1 MW from its UPS to provide direct support to the power grid. When sun and wind cause fluctuations, Aeven's UPS system can help with rapid stabilisation without compromising the stability of the data centre.

- The large share of renewable energy in Denmark generally leads to greater frequency deviations in the electricity grid. Data centres that are designed for this purpose can play a key role in enhancing grid stability and resilience in the future.
- This can be made possible by battery-based UPS (emergency power systems), which can be configured to deliver fast frequency response (FFR). In the event of sudden frequency drops, these batteries can either discharge energy into the grid or allow the data centre to temporarily disconnect and continue operations on its emergency power system. This instantly helps stabilise frequency while supporting the ongoing integration of renewable energy sources.
- In the future, data centres, that are designed to do so and can be appropriately compensated by grid operators, can offer a different form of flexibility through 'load shifting', where non-critical tasks (model training, updates, etc.) are shifted to periods when the grid is less strained. However, this requires that the data centre own and control its server loads.
- Currently, Danish data centres do not provide flexibility services to the grid because they are not designed for this purpose and there is a lack of clear financial incentives, technical guidelines from Energinet, and widespread adoption of the necessary control and battery technologies.

Note: UPS is Uninterruptible Power Supply.
Source: Implement Economics based on Danish Data Center Industry and Baringa.

Case: Net Zero Digital Energy Hub is a concept under development that enables climate-neutral data centres

Net Zero Digital Energy Hub

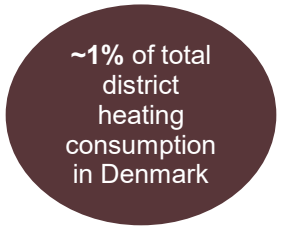


- The Danish Data Center Industry and the Net Zero Innovation Hub are collaborating on a new concept, the Net Zero Digital Energy Hub (NZDEH), aimed at developing climate-neutral data centres.
- Denmark's large share of green energy provides a strong foundation for it to become a global frontrunner in NZDEH solutions.
- The concept involves PtX plants that are connected directly to data centres, which are themselves located next to renewable energy plants.
- The connection of PtX plants to data centres enables the production of green backup fuel such as e-methanol.
- This allows diesel to be replaced as a backup, so operations can continue with no climate impact.
- At the same time, NZDEH will provide flexibility services to the grid during peak loads, for example by feeding power back into the grid from energy storage solutions or by load-shifting.
- Data centres and PtX plants can be connected to the district heating network and thereby supply surplus heat for production for district heating or other customers.

Source: Implement Economics based on the Danish Data Center Industry

Data centres currently supply district heating to approx. 15,000 households in Denmark, but the full potential depends on technical, geographical and regulatory barriers

District heating production
TWh



The EU's Energy Efficiency Directive requires data centres with a capacity of more than 1 MW to assess the economic and technical feasibility of implementing waste heat reuse, e.g. for district heating networks or industrial heating, to improve energy efficiency.

The Danish District Heating Association projects that by 2030, data centres could account for 6% of Denmark's total district heating production. Today, data centres supply district heating corresponding to approx. 0.2 TWh (about 15,000 households), or just under 1% of production. Greater use of the potential depends on several technical, geographical and regulatory barriers.

Technical barriers

- Data centres' excess heat of 25-35°C must be raised to 60-75°C to be used in the district heating network, which requires large, energy-intensive and expensive heat pumps.
- Data centres run year-round, but heat demand falls sharply in the summer, which means that part of the excess heat is still discarded unless investments are made in heat storage.
- Data centres take time to develop consistent surplus heat profiles, complicating contract negotiations.

Geographical barriers

- Data centres are often built near high-voltage plants or on cheap land far from dense district heating networks, which requires expensive, long and powerful pipelines to transport the heat. In addition, the heat demand outside major cities is limited.
- New data centres only reach full capacity after several years, which results in relatively small heat deliveries in the centres' early operation.

Regulatory barriers

- The sales price for surplus heat is subject to a statutory price cap, which has made many projects financially unprofitable. The price cap is set to be abolished on 1 July 2025.
- Electricity taxes can still make projects unattractive.
- District heating companies often prioritise self-produced heat from combined heat and power or biomass plants, which means that the data centres' surplus heat will only be attractive if it can match the very low marginal price that applies in the grid.

Note: The estimate is based on information about the data centres' district heating supplied in MWh and an average heat consumption of 13.7 MWh per household. A theoretical maximum heat production from data centres can be calculated based on their power consumption, however, the *full* potential depends on a number of factors that affect how far the surplus heat can be used.
Source: Implement Economics based on COWI, Danish District Heating, Ramboll and the Danish Data Center Industry.

Case: Three examples from Denmark show how strategic partnerships can increase data centres' recovery of surplus heat

1 

Four data centres in Høje Taastrup will supply surplus heat to 8,200 households via the district heating network

- **Pilot project:** In 2020, Høje Taastrup began using surplus heat from data centres when Høje Taastrup Fjernvarme installed a 1 MW heat pump at Nordea's data centre, feeding enough heat for approximately 700 homes into the grid.
- **The district heating companies own the heat pumps;** this reduces the investment risk for the data centre operators.
- **Local-to-regional scalability:** The VEKS grid ensures that if surplus heat exceeds local demand, it can be routed further into the network.
- In 2024, data centres supplied heat to around 2,200 homes in Høje Taastrup, and the Microsoft agreement is expected to supply heat to an additional 6,000 homes. Each MWh delivered avoids 25–35 kg of CO_2 compared to traditional district heating.
- Høje Taastrup serves as an example of how a municipality with a consumer-owned district heating company can start small, set strict return-temperature incentives and then scale data-centre surplus heat regionally as a central component of its fossil-free heating plan.

2 

Meta supplies heat from its hyperscale data centre in Odense to up to 9,000 households via the district heating network

- **Scalable infrastructure:** Heat recovery from the data centre's servers provides 165,000 megawatt-hours of free, surplus heat from the service halls to the local district-heating network operated by Fjernvarme Fyn, supplying up to approximately 9,000 households in Odense. In the future, there is potential to expand capacity even further.
- **Early integration of heat recovery:** During the planning phase of the hyperscale data centre, the possibility of recovering surplus heat was already considered. This required a close, three-way collaboration between Meta, Odense Municipality, and Fjernvarme Fyn on regulatory approvals, local planning and technical design.
- **Collaboration model and investments:** District Heating Fyn has financed and operates the large, high-temperature heat pumps at Tietgenbyen's Heating Plant, while Meta has financed the installation of heat exchangers, piping and other equipment on-site at the data centre, and continues to cover the operation and maintenance of these systems.
- Meta's data centre in Odense demonstrates how a single hyperscale data centre, in collaboration with a consumer-owned district heating company, can become a key element of a city's fossil-free heating plan without taking on the entire investment in heat pump capacity.

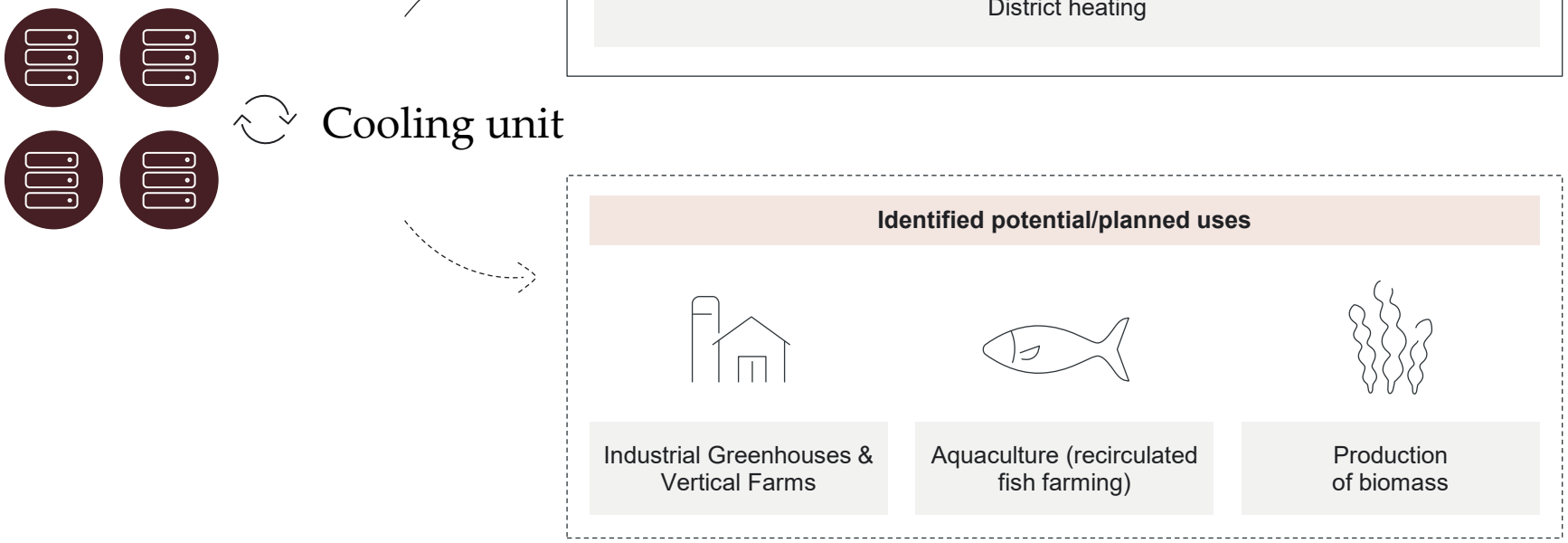
3 

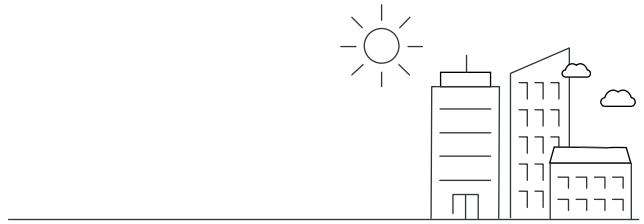
Net Zero Innovation Hub in Fredericia gathers the industry to mass-commercialise surplus heat from data centres across Europe

- **Industry-led team:** Six global players (Danfoss, Google, Microsoft, Schneider Electric, Vertiv and Data4) launched the hub in 2023 and anchored it at the Danish Data Centre Industry in Fredericia. The neutral platform provides quick decision-making paths and high legitimacy.
- **Open innovation platform for surplus heat:** The hub has developed a heat-reuse reference design and a public Heat Reuse calculator, which makes it easy for utilities and cities to see the price level and CO_2 gain of buying heat from data centres.
- **Standardised business models:** The Net Zero Innovation Hub helps new green energy solutions move safely from idea to scale by (i) bringing the data centre industry together around one common set of requirements, (ii) finding the most promising solutions that can be mass-produced and delivered by a resilient supply chain, and (iii) conducting large-scale demonstration projects where costs are shared between private companies and public funds.

Implement Economics based on Danish District Heating, Meta, NZIH and HTF.

The data centre industry is constantly innovating in new ways to capture and repurpose excess heat, enhancing energy efficiency and cutting carbon emissions





- Although data centres today have a large theoretical maximum potential for reusing surplus heat in the district heating network, barriers and a lack of demand can get in the way of full utilisation.
- In Varde Municipality, atNorth and Wa3rm have applied to establish a data centre from which the surplus heat will be used for the operation of greenhouses.
- In Sweden, EcoDataCenter and Wa3rm will supply the surplus heat from a 150 MW data centre to local fish farms, which will heat ponds to 12-15°C and extend the growing season for rainbow trout year-round.
- In pilot projects in France, led by Data4Group with the Université Paris-Saclay, the possibility of using the surplus heat to cultivate biomass (algae) for reuse in new circular energy projects is being investigated.
- These new and potential channels can alleviate the current problem that prevents maximum utilisation of the generated surplus heat from Danish data centres.

Source: Implement Economics based on DataCenter Knowledge, DCD, Danfoss and atNorth.

03

Economic growth in local areas

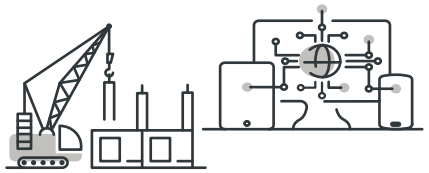
Investments in data centres create economic activity and jobs in Denmark's local areas

Investments in data centres create economic activity in local areas, which contributes to GDP and creates jobs in Denmark

The cost of setting up and operating a data centre creates activity that spreads through the economy

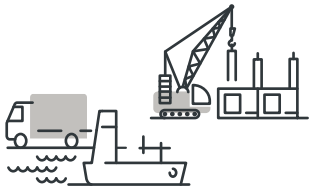
Direct effects

The direct effects are the activities that take place at the data centres during the construction phase and during operation (e.g. management, technical operation and maintenance, IT and system administration, as well as handling of electricity, water and air conditioning systems).



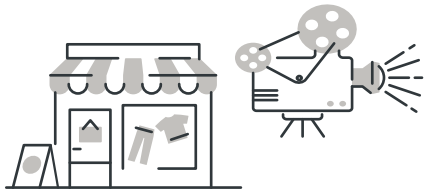
Indirect effects

The indirect effects are the activities of suppliers and subcontractors as a result of the data centres' purchases. These includes procurement during the construction phase (e.g. construction and contracting services) and during operations (e.g. services related to facility management).



Induced effects

The induced effects occur when salaries paid to employees and suppliers are spent in Denmark (e.g. shopping, restaurant visits and experiences).

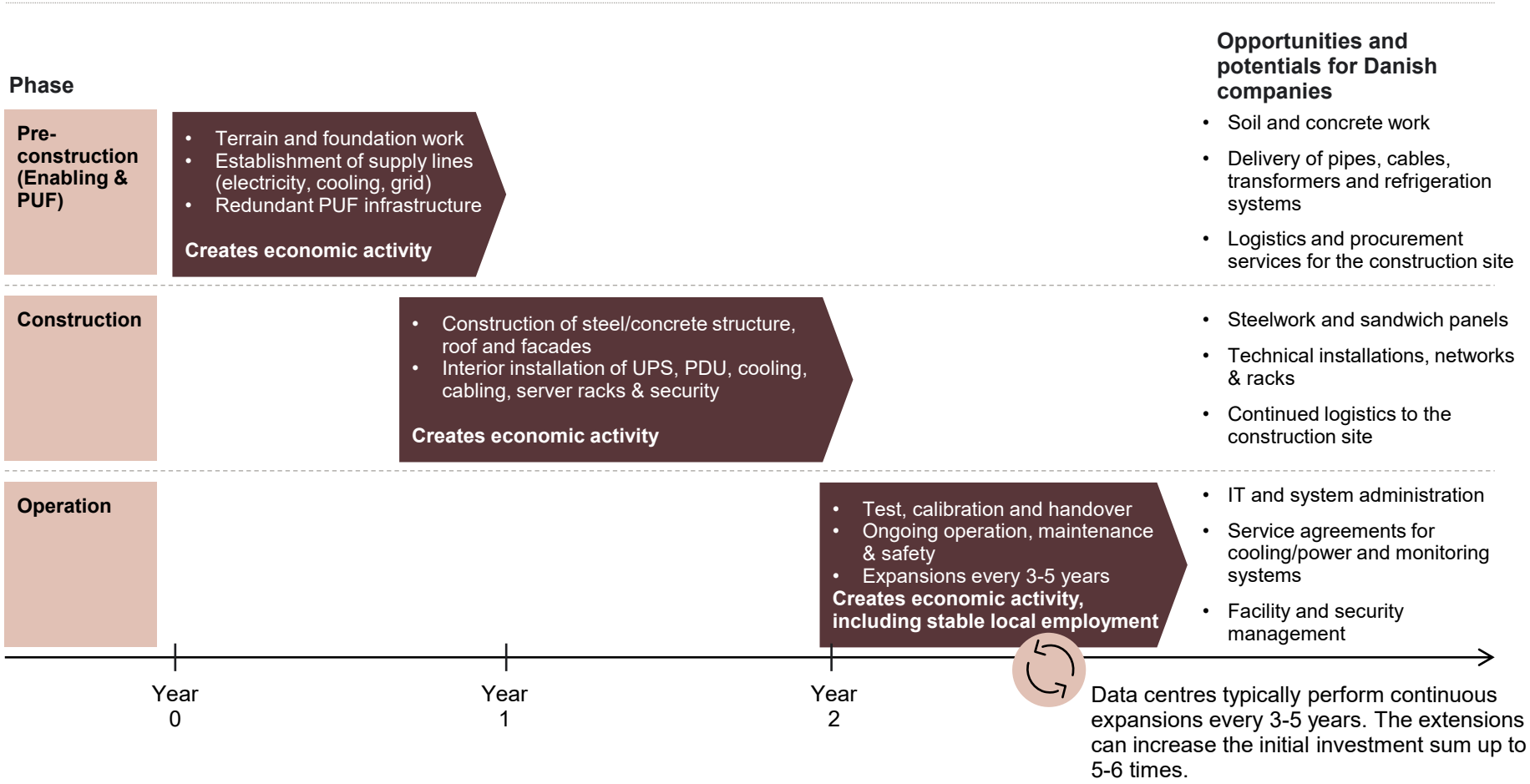


- The construction of data centres requires investments in both time and money, including civil engineering, construction of buildings and technical equipment.
- The subsequent operation of the centres is characterised by expenditure on electricity consumption, security services and continuous technical maintenance.
- These activities contribute to activity and employment in Denmark.
- The costs of establishing and operating a data centre create activity (direct effects) that spreads through purchases from external suppliers (indirect effects), and via consumption from employees and suppliers' salaries (induced effects).
- These economic effects are estimated by an input-output model that describes how increased activity in one sector creates derived activity in other sectors, and how this overall effect affects GDP and employment across the economy.[1]
- Large data centre operators typically also invest in the surrounding local community in areas such as education and training, business development, local community projects and the green transition.[2]

Note 1) The analysis is based on an input-output model, which uses national input-output tables to calculate multipliers that describe how sectors of the economy are connected through their consumption of each other's goods and services. The model is used to estimate effects on GDP and employment by measuring the direct, indirect, and induced effects of investments in the data centre industry that spread to the rest of the economy. The analysis uses Statistics Denmark's input-output multipliers. 2) These effects are not included in the estimate of the data centre industry's contribution to the Danish economy.
Source: Implement Economics based on Statistics Denmark, Miller and Blair and the Bureau of Economic Analysis.

The construction and operation of data centres in Denmark are investment-heavy and typically takes place in three phases

Timeline for the construction and operation of a data centre



Investments in Danish data centres create economic activity, but imports of servers from abroad *do not contribute* to the Danish economy

- Before the construction begins, the data centre operators make large purchases of servers.
- The server purchases accounts for about half of the total investment for the construction of a data centre.
- The servers are imported, and the purchase of these does not create activity in Denmark.
- On the other hand, the installation of the servers creates activity in Denmark, which is included in this report.

Note: There is uncertainty about the timeframe for establishing data centres, as both the size of the project and the planning, approval and construction phases can vary significantly from project to project.
Source: Implement Economics based on Meta, the U.S. Chamber of Commerce and the Danish Data Center Industry.

The global growth in the data centre industry creates export opportunities for Danish companies

The growing demand for data centres, driven by e.g. artificial intelligence, has created significant growth opportunities for Europe's industrial companies. Four older industrial companies—Siemens, ABB, Legrand and Schneider Electric—have increased their market capitalisation by more than DKK 1.1 billion due to this demand, according to the Financial Times. Likewise, Denmark has several strong industrial subcontractors to the data centre industry that can take advantage of the rapidly growing data centre market and at the same time can export green technology and knowledge.

Danfoss is a global Danish company that provides advanced cooling and heat management solutions to data centres worldwide. In their latest annual report, they define data centres as a market segment experiencing strong growth. Danfoss exports compact cooling systems and heat pumps that help data centres keep servers cool in an energy-efficient way. Danfoss has tested and fine-tuned its solutions, including through a collaboration with Google.

> We want to revolutionise how we build and decarbonise data centres together with our customers. When we partner up across industries, like we have done with Google, we accelerate this development towards building better and more sustainable data centres — using technologies available today.
>
> **Jürgen Fischer, President of Danfoss Climate Solutions**

Novenco from Næstved produces high-efficiency fans that are used to remove heat from large server halls. Their fans are simple to install, keep noise levels down, and require very little maintenance. In Denmark, the technology has proven effective in new data centres, and now it is exported as complete ventilation packages to customers in Europe, the United States and Asia.

> Since our first deliveries to Facebook's (now Meta, ed.) data centre in Luleå, Sweden, we have invested heavily in further refining the design and implementing new advanced technology [...]
>
> **Lars Knaack, CEO at NOVENCO Building & Industry**

DEIF is a Danish company that specialises in control and monitoring equipment for critical installations such as data centres. They export simple control units that ensure backup generators start immediately in the event of a power failure, and at the same time can integrate solar and battery solutions. In their annual report, they attribute the increased demand for their critical installations for data centres, and in 2024, DEIF won the award for Technology Innovation 2024 from the Danish Data Center Industry.

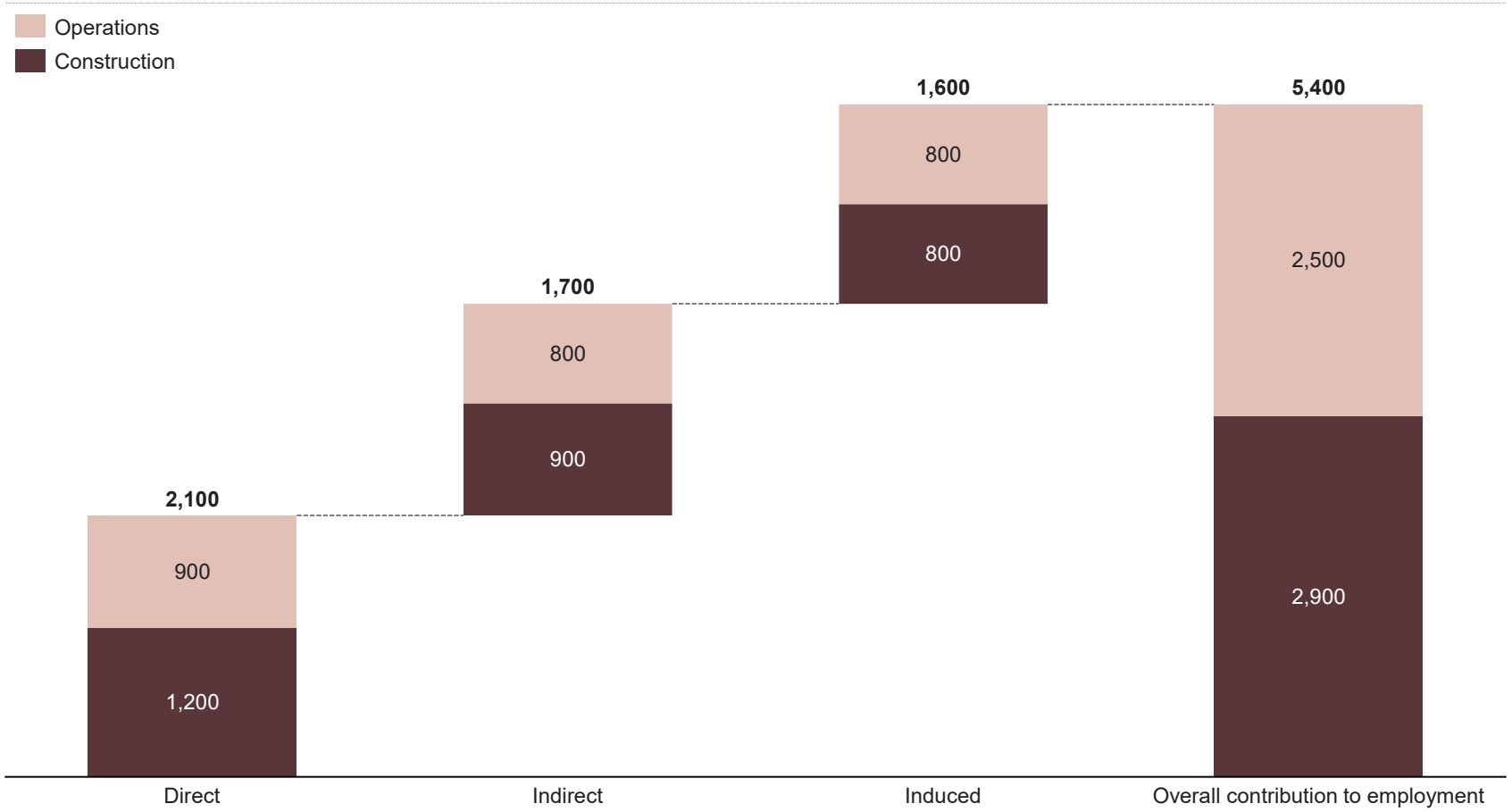
Source: Implement Economics based on Financial Times, Danfoss, Novenco and DEIF.

The data centre industry supported 5,400 jobs in the construction and operations phase in 2024

Jobs

Data Centre's contribution to Denmark's employment, 2024

Number of full-time employees



- In 2024, the Danish data centre industry supported 5,400 jobs.
- 2,500 of these jobs were in the operation of the centres, while 2,900 were related to the construction of the centres.
- Danish data centres directly employed 2,100 people, of whom 900 were in operation and the rest were related to the construction phase.
- Data centres made material purchases and used services such as power supply, security services and consultants from local suppliers, which supported an additional 1,700 jobs indirectly.
- Salaries paid to employees and suppliers resulted in private consumption, which contributed an additional 1,600 jobs.
- This means that 10 direct jobs in the operation of data centres supported 18 jobs in the rest of the Danish economy. Similarly, 10 direct jobs in connection with the construction of data centres supported 15 jobs in the rest of the Danish economy.
- Jobs in data centres are relatively more productive compared to jobs in many other industries, which is reflected in a higher value creation per employee.[1]

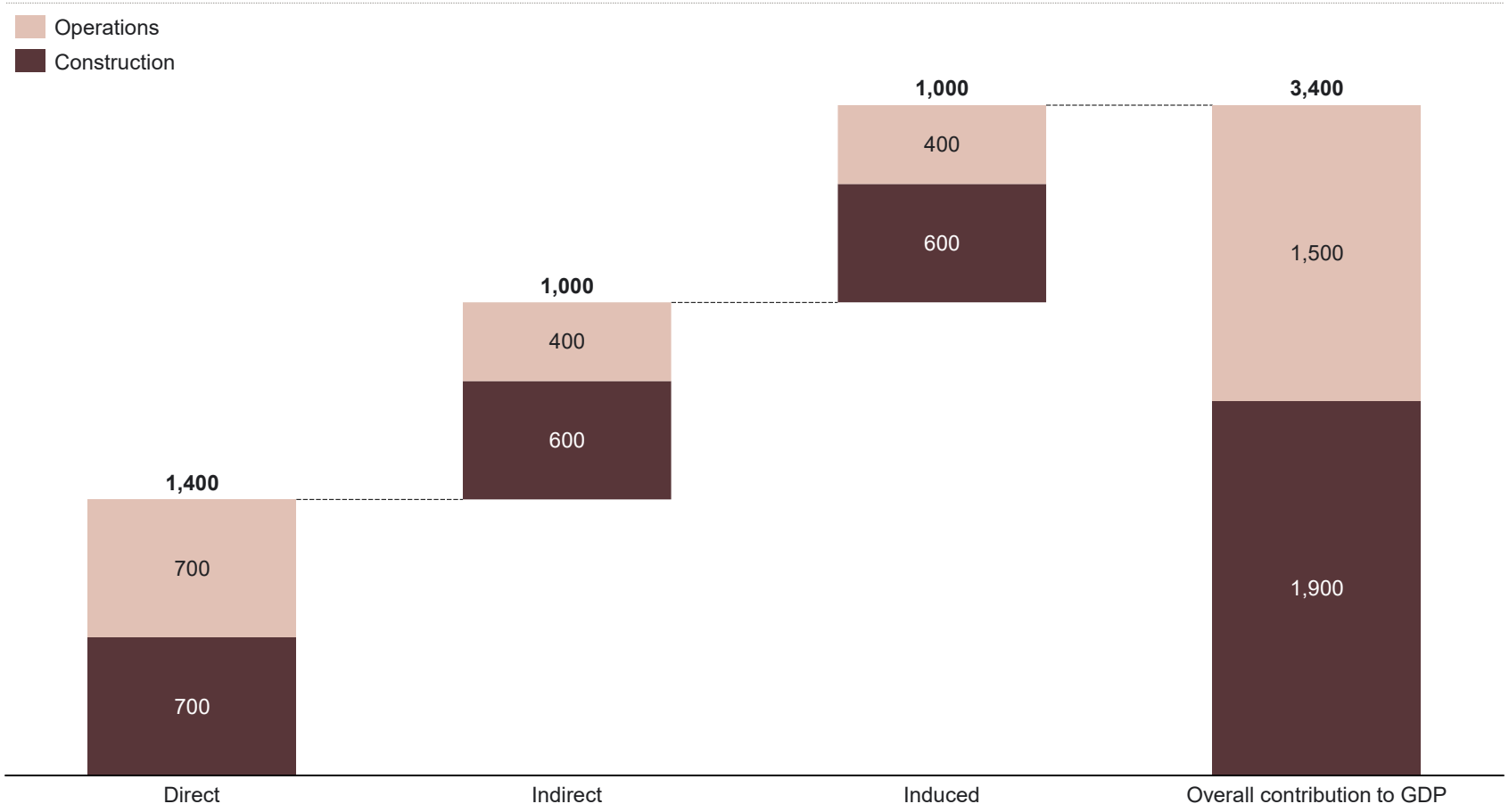
Note 1) Direct jobs in the operation of data centres have a productivity (GDP/job) of DKK 0.77 million, while direct jobs in connection with the construction of data centres have a productivity (GDP/job) of DKK 0.58 million.
Source: Implement Economics based on Statistics Denmark, Meta, Miller and Blair, Bureau of Economic Analysis, U.S. Chamber of Commerce and the Danish Data Center Industry.

In 2024, the data centre industry has contributed directly with DKK 1.4 billion to GDP and indirectly supported DKK 1 billion in value creation for suppliers

GDP

Data centres' contribution to Denmark's GDP, 2024

DKK million



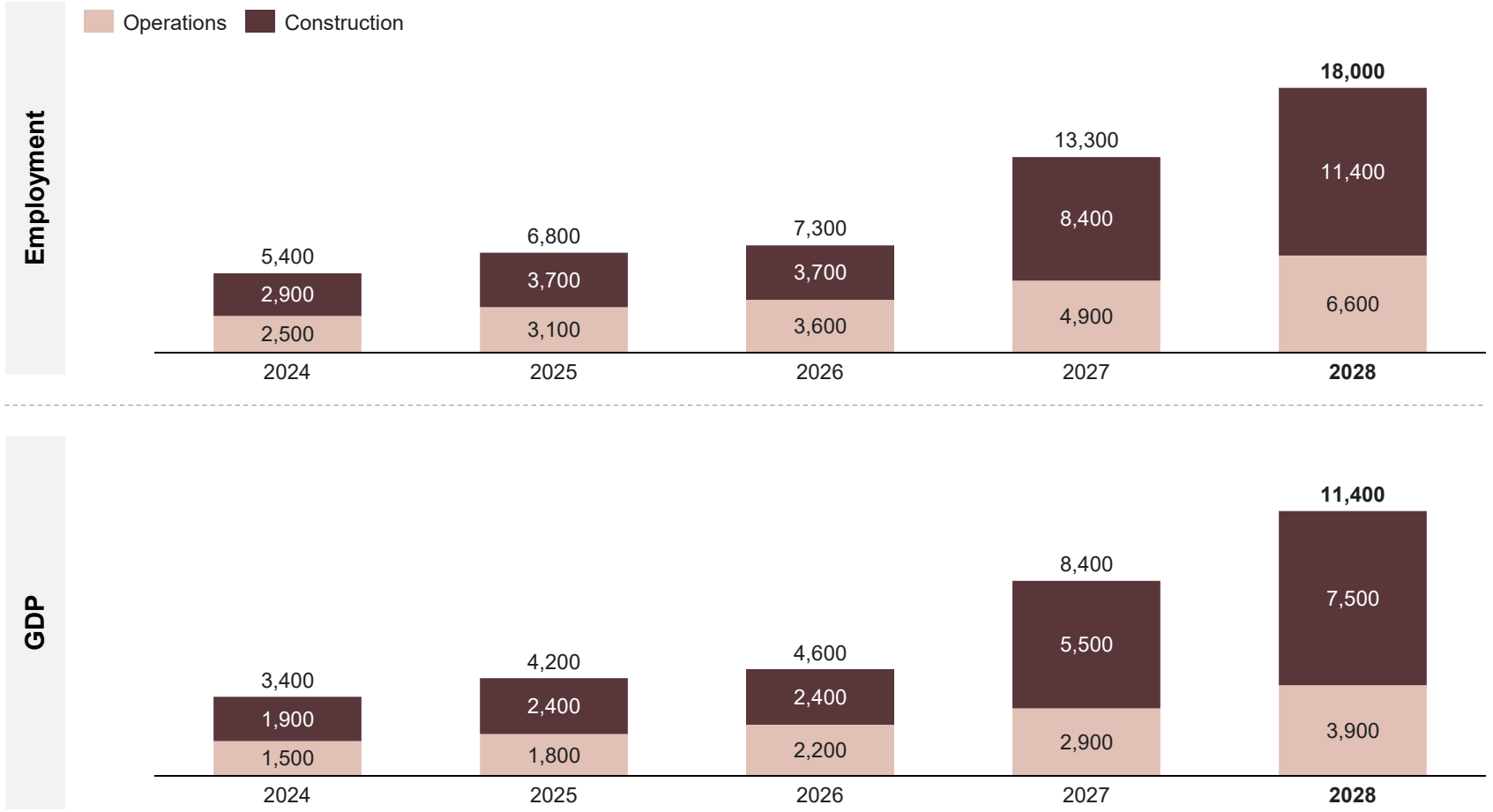
- In 2024, the Danish data centre industry contributed DKK 3.4 billion to Danish GDP.
- DKK 1.5 billion of the contribution came from the operation and maintenance of the centres, while DKK 1.9 billion came from the construction of data centres.
- Danish data centres contributed DKK 1.4 billion directly to GDP in 2024, divided approximately equally between operations and construction.
- Subcontractor activity linked to the data centres contributed almost DKK 1 billion to GDP in 2024.
- Salaries for employees and suppliers resulted in private consumption, which contributed an additional DKK 1 billion to GDP.

Kilde: Implement Economics based on Statistics Denmark, Meta, Miller and Blair, Bureau of Economic Analysis, U.S. Chamber of Commerce and the Danish Data Center Industry.

The data centre industry is expected to grow by 160% by 2028, when the industry will contribute 18,000 jobs and DKK 11.4 billion to the Danish economy

Data centres' contribution to Denmark's *employment* and *GDP*

Employment: Full-time employees, GDP: DKK million (2024 prices)



- Over the next four years, significant investments will continue to be made in the Danish data centre industry.
- The result of this is an approximate 160% increase in operational IT capacity towards 2028, which will give rise to major investments in the coming years.
- From 2026 to 2027, significant completions and commissioning of MW capacity are expected, which is reflected in a large increase in the annual contribution to GDP and employment.
- With the expected development in the Danish data centre market, the investments and operations will contribute approximately DKK 11.4 billion to GDP and support 18,000 jobs in 2028.
- The majority of the jobs created will be located in the local areas where most data centre deployments will take place.
- In addition to the direct and indirect effects of data centre construction and operation, the availability of local data centres creates knowledge spillovers for the benefit of Danish companies, especially SMEs.

Note: The development is based on annual changes and how many MW are expected to be in operation at the end of each year according to the Danish Data Center Industry's projection.
Source: Implement Economics based on Statistics Denmark, Meta, Miller and Blair, Bureau of Economic Analysis, U.S. Chamber of Commerce and the Danish Data Center Industry.

04

Appendix

Methodology | An input-output model is used to quantify the contribution of data centres to GDP and employment in Denmark

Direct effects

The direct effects are the activities that take place at the data centres during the construction phase and during operation, e.g. management, technical operation and maintenance, IT and system administration, as well as the handling of electricity, water and air conditioning systems.

These effects are estimated using **direct multipliers**, which indicate how much GDP or employment increases when demand in the data centre industry increases by DKK 1 million.

Indirect effects

The indirect effects are the activities of suppliers and subcontractors as a result of the data centres' purchases. This includes procurement during the construction phase, e.g. construction and contractor services, and during operations, e.g. services related to facility management.

The effects are estimated using **indirect multipliers**, which indicate how much GDP increases when demand from these suppliers grows due to the increase in the data centre industry's demand by DKK 1 million.

The effects on employment are estimated by a combination of **indirect multipliers** and **Type I multipliers**. Type I indicates how many additional jobs are created when one person is hired directly in the data centre industry.

Induced effects

The induced effects occur when salaries paid to employees and suppliers are used in Denmark, e.g. shopping, restaurant visits and experiences.

These effects are estimated using **induced multipliers**, which indicate how much GDP increases when wages paid to the new direct and indirect employees are converted into private consumption, thereby generating additional economic activity.

The effects on employment are estimated by a combination of **induced multipliers** and **Type II multipliers**. Type II estimates how many jobs are created based on the increased consumption from direct employment of one person and the derived indirect employment.

Method description

- To quantify the economic contribution of data centres, an input-output model based on data from Statistics Denmark is used, describing the flow of finished goods, intermediate products and services between industries.
- An input-output model is a simplified table that maps out who buys what, and from whom, in the economy. The model estimates both the effects from the supply chain and from the employees' consumption.
- The relationship between an industry's inputs and outputs is assumed to be constant in input-output models, implying that industries operate under constant economies of scale.
- Based on the input-output tables, Statistics Denmark calculates a set of multipliers that make it possible to assess the economic impact of the data centre industry on the rest of the economy.
- The effects assessed in an input-output model are gross effects, meaning that they do not take into account any potential diversion of resources from other activities in the Danish economy.

Note: The analysis is based on an input-output model, which uses national input-output tables to calculate multipliers that describe how sectors of the economy are connected through their consumption of each other's goods and services. The model is used to estimate effects on GDP and employment by measuring the direct, indirect, and induced effects of investments in the data centre industry that spread to the rest of the economy. The analysis uses Statistics Denmark's input-output multipliers.
Source: Implement Economics based on Statistics Denmark, Miller and Blair and the Bureau of Economic Analysis.

Authors
- Nikolaj Tranholm-Mikkelsen
- Mathias Pedersen
- Bodil Emilie Hovmand
- Martin H. Thelle

Disclaimer

This report (the "Report") has been prepared by the Implement Consulting Group (Implement). The purpose of this Report is to assess the socio-economic footprint of the data centre industry in Denmark. All information in the Report is derived from or estimated on the basis of Implement's own analysis using proprietary and publicly available sources.

Danish Data Center Industry (the "Company") has neither provided company data nor endorsed the estimates made in the Report. In addition to primary market research and publicly available data, Implement's analysis is based on third-party data provided by the Company. In preparing the Report, Implement has placed emphasis on the accuracy of the information provided by the Company, without independent verification. Where information has been obtained from third-party sources and proprietary research, this is clearly referenced in the footnotes. The Report is based on work carried out from April 2025 to June 2025. Implement makes no representation or warranty as to the correctness, accuracy or completeness of the content of the Report, or as to whether it is adequate or fit for the purposes of the Company or the reader, and Implement assumes no liability to the Company, the reader or any other legal entity for any loss or damage resulting from the use of any part of the information contained in the Report. The information contained herein may be changed, supplemented or corrected without notice. By submitting the Report, Implement assumes no obligation to make any further information available to the Company.