Reduce, Re-use, Respond

INTEGRATING DATA CENTRES INTO EUROPE'S ENERGY SYSTEM

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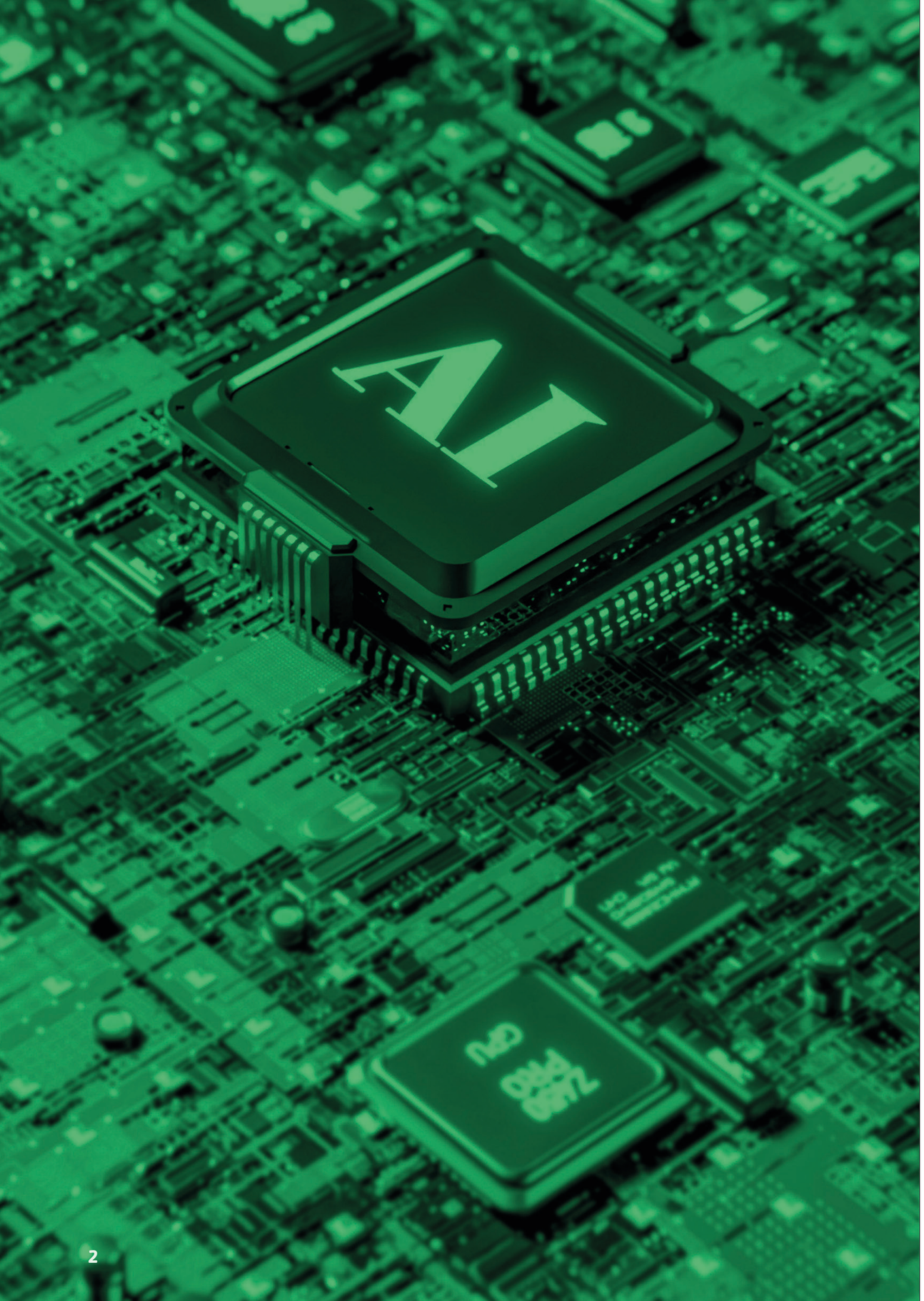

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INTEGRATING DATA CENTRES INTO EUROPE'S ENERGY SYSTEM

How targeted energy efficiency, strategic heat reuse, and demand-side flexibility coupled with competitive framework conditions can transform data centres from energy-intensive consumers into valuable assets for Europe's energy system.

Data centres are the backbone of Europe's digital economy, powering everything from simple everyday digital services to AI and cloud computing. As the EU strives to position itself as a global AI leader[1] – using AI to improve both competitiveness and digital sovereignty – increasing data centre capacity is a prerequisite. Accordingly, **European data centres' power consumption is set to grow by two-thirds** and reach almost 115 TWh by 2030,[2] corresponding to the electricity consumption of more than 30 million average European households.[3]

It will be no easy task to meet the power demand and integrate data centres in the energy system in an efficient, sustainable, and competitive way. But existing green technology is ready to ensure that **data centres become valuable assets to the energy systems** and **lower their operational costs**. This requires a strategy centred on three core principles: **Reduce, re-use, and respond**.

Reduce:

Data centres shall continue their efforts on energy efficiency and optimize their power consumption as much as possible, thereby partnering with the grids and reducing overall energy grids and system costs.

Re-use:

Almost all electricity consumed by data centres is converted into heat, much of which can be re-used for heating in buildings, industrial processes, electricity generation and much more, where supported by enabling infrastructure and planning.

Respond:

Consumption and flexibility should go hand in hand. Data centres are not just consumers but are already willing partners to the grid. With the appropriate frameworks which accounts for operational needs, they can provide flexibility services to the grid in the form of high-speed frequency response, energy storage, and load-shifting in time and space.

1 The European Commission 2025: The AI Continent Action Plan
2 IEA 2025: AI and Energy. Others, like McKinsey & Company 2024: The role of power in unlocking the European AI revolution, assess that the sector's power consumption could even reach up to 150 TWh by 2030.
3 Based on an average electricity consumption per household of 3675 kWh in 2022 according to Odyssee-Mure data

Focus: Excess heat potential

The excess heat levels currently available from data centres[4] already correspond to almost twice the energy consumed for heating in households across the Scandinavian EU countries.[5] In Denmark, excess heat from Apple's data center lowers the energy bill by €95 million over a 20-year period for the 20.000 local district heating customers in Viborg.[6] In Hamina, Finland, excess heat from Google's data center deliver 80 pct. of the local district heating energy with 97 pct. carbon-free energy.[7]

4 221 TWh/year according to Mathiesen et al. 2023: Heat Matters: The Missing Link in REPowerEU: 2030 District Heating Deployment for a long-term Fossil-free Future. *Aalborg Universitet*.
5 116 TWh in total according to latest available data (2022) from Eurostat: Disaggregated final energy consumption in households – quantities.
6 Viborg Varme: Letter regarding excess heat price cap.
7 Google 2024: Our first offsite heat recovery project lands in Finland

Recommendations

Globally available and proven technology to reduce energy consumption, re-use the excess heat, and activate the flexibility potential of data centres already exists. But to ensure proper integration of data centres in the energy system, political action at the EU level is required to put the right framework in place. We recommend the following:

1

Reduce:

SET TARGETS AND STANDARDS FOR ENERGY SAVINGS

- Energy efficiency is part of the business model for the operators and the industry has a very strong track record of driving energy gains. Saving energy reduces costs and boosts competitiveness. Energy efficiency requirements, standards and rating schemes coming from EU can contribute to raise the bar for the industry and should aim to create a level playing field across all EU Member States
- If we manage to improve efficiency of data centres by 16 pct. in 2030,[8] the EU will **save up to almost 20 TWh power**. The cost of installing this amount of offshore wind[9] is more than **€12.5 bln.**[10]
- To support the focus on efficiency, EU data centre reporting demands[11] should be assessed and simplified to those only strictly required to measure energy and water sustainability.

2

Re-use:

SMART PLANNING FOR UTILIZATION OF EXCESS HEAT

- Physical distance is important when determining the feasibility of excess heat integration in district heating networks. Therefore, excess heat integration requires coordination between heat planning and placement of data centres.
- The EU should encourage Member States to integrate data centre locations into urban and industrial planning to maximize waste heat utilization. Further, actors beyond the data centre operators such as local governments, and heating network providers should be encouraged to participate in facilitating infrastructure investments.
- Moreover, the EU should urge member states to remove financial and regulatory barriers and simplify administrative processes to encourage investment in waste heat reuse by ensuring that taxes and tariff structures support excess heat utilization appropriately, introducing financial incentives such as tax reductions or carbon credits for data centres that invest in heat recovery systems when aligned with broader energy and urban planning goals, and expand access to public and private green financing for district heating networks utilizing data centre waste heat.

3

Respond:

STRENGTHEN DEMAND -SIDE FLEXIBILITY

- Flexibility is crucial for integrating renewable energy, ensuring resilience against grid fluctuations, and reducing energy system costs.
- To unlock this potential, it is crucial to develop demand response frameworks that are sensitive to the operational requirements of data centres and provide clear economic signals and benefits for participation.
- The EU should strengthen coordination between data centres and grid operators to advance data centre integration in the system services market through improved signalling, appropriate incentives, and frameworks that recognize their operational needs.
- The EU should also initiate pilot projects and case studies where various flexibility mechanisms are tested in different contexts, with focus on highlighting economic benefits for data centre and grid operators.
- Furthermore, EU electricity market mechanisms should evolve to better incentivize the development and procurement of firm and flexible carbon-free resources, including through instruments like 24/7 carbon-free Power Purchase Agreements and granular Guarantees of Origin, which enable data centres and other large consumers to actively support grid decarbonization.

8 16,28 pct. is what is expected in terms energy savings in a high efficiency scenario by IEA compared to the projected base scenario in IEA's 2025 report, 'AI and Energy'. The savings are based on a projected energy consumption in 2030 of 113 TWh according to IEA 2025. The comparison to offshore wind serves as an illustration. In practice, data centres will be supplied by a variety of energy sources and technologies.

9 Based on data regarding weighted average total installed cost for offshore wind in Europe and average capacity factor according to IRENA 2024: Renewable Power Generation Costs in 2023 and Danish Energy

10 Agency: Technology Data Catalogue for Generation of Electricity and District heating. The prices are adjusted to 2025-levels as per Eurostat 2025: HICP – monthly data (change of rate).

11 COMMISSION DELEGATED REGULATION (EU) C(2024) 1639 final of 14.3.2024 on the first phase of the establishment of a common Union rating scheme for data centres

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