
Easing data centre integration in Europe

Benefits of unlocking data centres' flexibility potential

ACEF 2026, Session 4: Solutions Lab – What Digital Opportunities Can
DMCs Take Advantage of?

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Grid constraints increasingly limit
European data centre expansion

The expansion of data centres in Europe is set to grow, significantly increasing electricity demand.

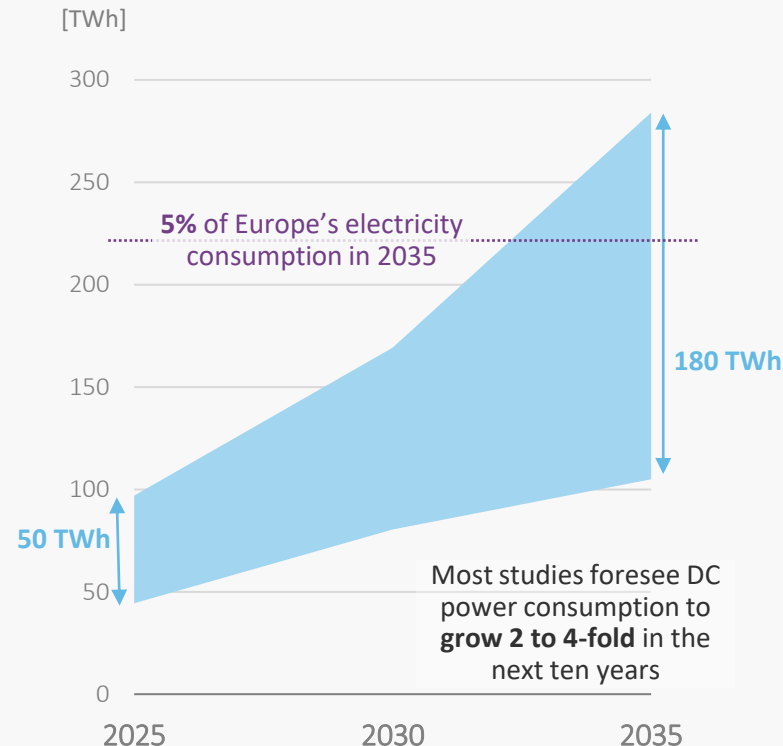
Europe's ambition

AI Continent Action Plan:

Triple European data centre capacity within the next 5 to 7 years

3x

Resulting data centre electricity demand evolution









Data centres are large consumers of electricity and their expansion may induce major grid infrastructure upgrades

- **Grid connection queues** can be as long as 7–10 years in Europe, slowing down data centre deployment
- **Limitations on data centre expansion** are already in place e.g. in Dublin, Amsterdam and Frankfurt
- Concerns are growing on data centres' **impacts on end-consumer electricity costs**

Operating data centres more
flexibly can help overcome grid
constraints

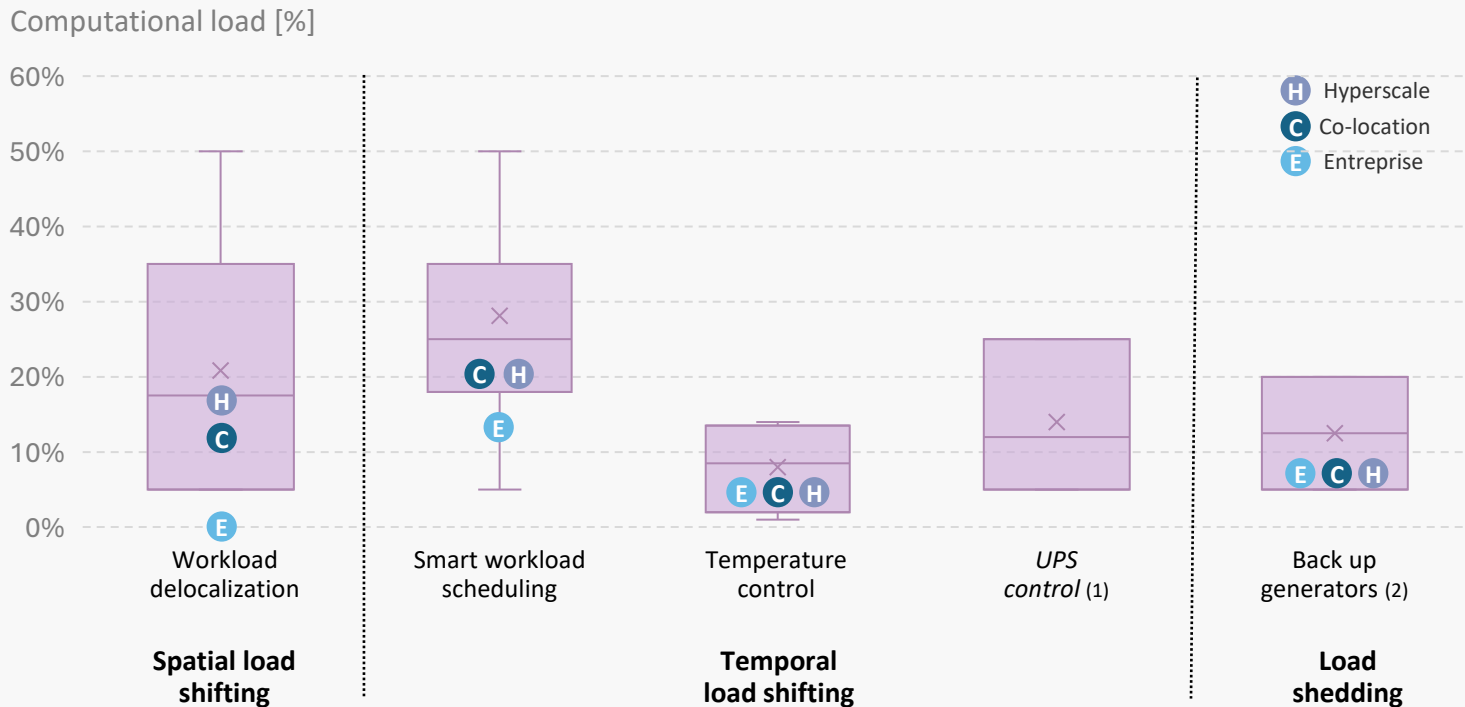
Data centres have multiple levers for peak shaving and daily flexibility

Flexibility source	Flexibility lever	Underlying mechanism	Flexibility type	Constraints
IT system load	Data centre fleet workload scheduling	Computation tasks are shifted to another data centre where power system conditions are more favourable		Reserved to fleet operators (mostly hyperscale)
	Smart workload scheduling	Some computation tasks can be delayed and run during periods of lower stress on the grid		Only for time independent tasks (AI training, batch jobs)
Cooling system load	Temperature control management	Thermal inertia creates a buffer while cooling power can be modulated to keep server temperatures within acceptable limits		Lower thermal inertia of newer server generations
On-site power systems	Back-up generators	During periods of high grid stress, backup generators can take over, so the data centre's power demand is no longer supplied by the grid (shedding)		Predominantly powered by fossil fuels
	Uninterruptible Power Systems (UPS)	The UPS system, designed to power the data centre while backup generators start during an outage, can also be used to provide ancillary services to the grid		Operator reluctance (fear of reduced reliability)
	Battery Energy Storage Systems (BESS) management	For reliability or under specific connection contracts, data centres can be co-located with BESS, which can be operated as a fully flexible asset: charging during periods of energy abundance and covering the data centre load during times of system stress		Requires BESS system design or retrofit



Not all data centres can tap into the same flexibility potential

Data centre flexibility potential by flexibility lever and data centre type



Based on literature review. The violet box is the interquartile range between the 1st quartile (25% of observations are lower than this value) and the 3rd quartile (25% of observations are higher). The bar in the box is the median, while the X is the mean. Whiskers are for maximum and minimum values. Dots represent modeling input assumptions. (1) UPS system can contribute to sub-hourly flexibility which is not integrated in this current model set-up (2) Back-up generators can shed the entire data centre load but can only be used a certain number of hours across the years

Technical and operational factors shapes DCs flexibility potential, including ownership models, contractual frameworks and the nature of computational tasks – examples:

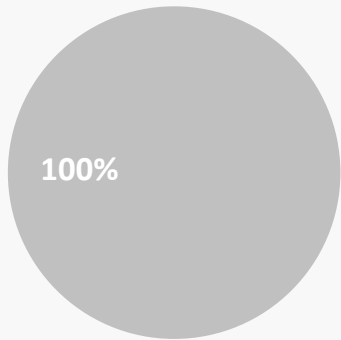
- Data processing can be more easily moved in time and/or location compared to latency-sensitive tasks such as financial transactions
- Hyperscalers/fleet operators, through their portfolio of distributed assets, are better positioned to provide spatial flexibility
- Co-location centres: Contractual constraints as provider must meet SLA commitments but does not control clients' servers and loads

Even modest flexibility contributions can reduce data centres' peak load by 45% across the modelled countries

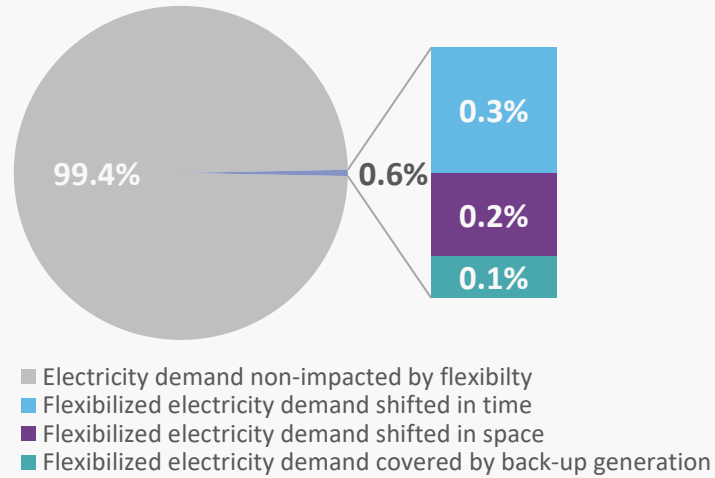
Mandated flexibility scenario: Data centre operators are asked by system operators to reduce their electricity consumption during a limited number of hours with high grid stress (peak demand hours)

- **Load reduction limit:** daily 4 h / yearly 120 h
- **Flexibility levers:** spatial and/or temporal shifting of computational loads, reduction of electrical load through activation of BESS or backup generators

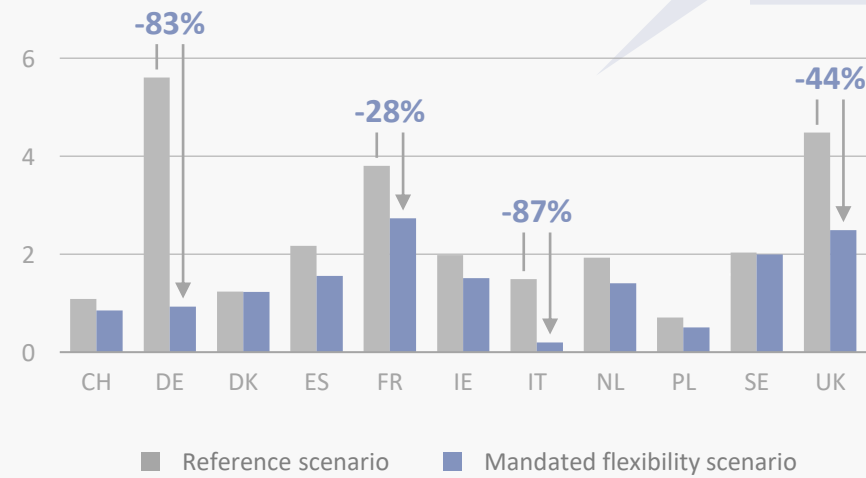
Reference scenario



Mandated flexibility scenario (2035) – change of annual data centre electricity demand [%]



Mandated flexibility scenario (2035) – data centre impact on residual peak loads [GW]



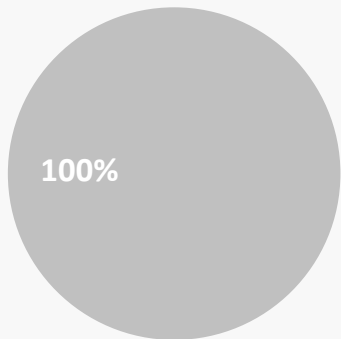
EUR 500 m in cost savings as less thermal power plants are needed to meet peak load demand*

Data centres as grid assets: Optimising flexibility from data centres amplifies system benefits

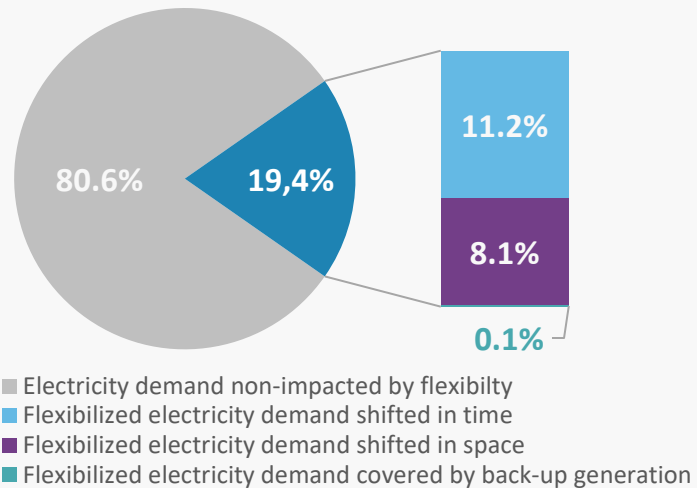
Open EU flex scenario: Data centre operators actively optimise electricity demand within the technical limits of data centres without impacting operations

- **Load reduction** constraint to the technical potential of data centres
- **Flexibility levers:** spatial and/or temporal shifting of computational loads, reduction of electrical load through activation of BESS or backup generators

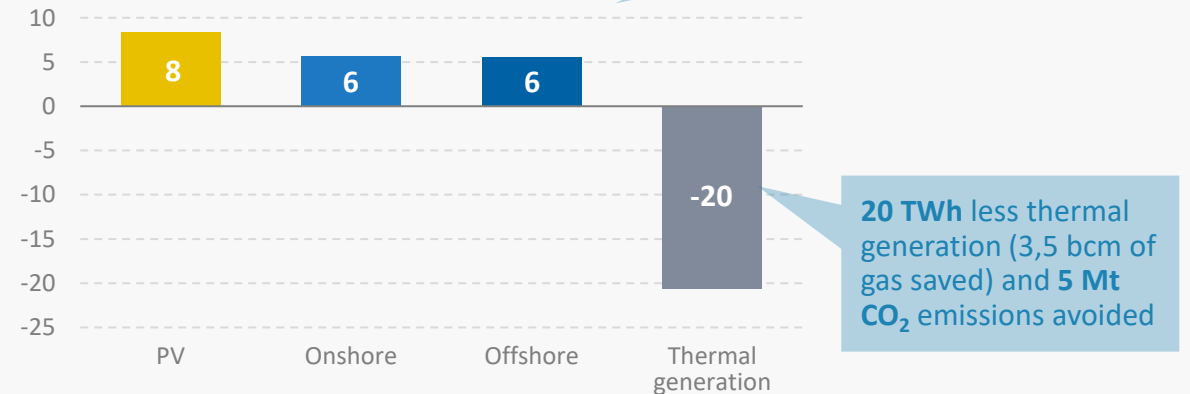
Reference scenario



Open EU flex scenario (2035) – change of annual data centre electricity demand [%]



Open EU flex scenario (2035) – impact on the annual electricity mix [TWh]



Flexible connection agreements support data centres' grid integration

Existing incentives do not sufficiently support the provision of flexibility services

- DCs' responsiveness to electricity price signals is low as cost savings from optimizing market positions are small compared to capital costs, revenues and SLA risk exposure - while PPAs may dampen price exposure.
- Service Level Agreements (SLAs) set high performance thresholds that constrain load reduction/demand response:
 - Availability, performance (latency, throughput, consistency), reliability, etc
 - Meeting SLA commitments is a primary objective, failure to do so comes at a high cost

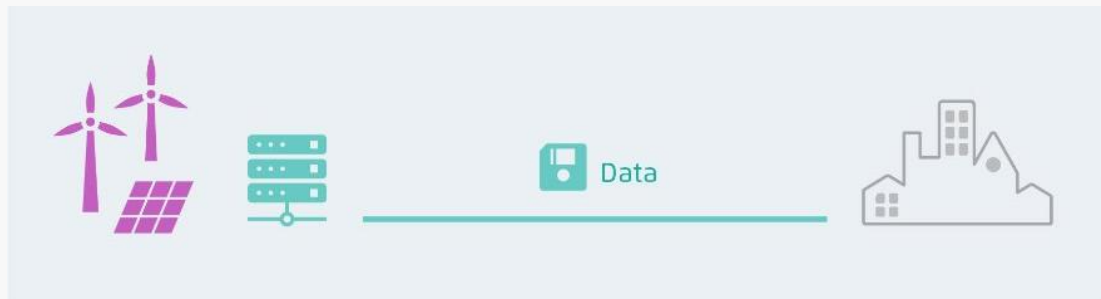
Flexible connection agreements (FCAs) are emerging as a promising mechanism to facilitate grid connection

- Data centres commit to providing demand response during system stress in exchange for expedited grid connection
- By using DCs flexibly, existing generation and network assets can be optimized, supporting efficient investment planning
- Flexible connection agreements:
 - facilitate the build out of data centers in a system-aligned manner (faster connection)
 - Unlock flex through contractual obligation layered on top of market incentives
 - Within operational limits so that SLA performance is maintained

No-regret option: Locating data centres in areas with high renewable energy resources and/or low grid constraint expectations

Moving data is less expensive than moving electricity

- Transmission lines can cost from EUR 0,3 mil to 2 mil per kilometre, while optical fiber infrastructure costs from EUR 14,000 to 42,000 per kilometre
- Locating data centres in areas with high RE endowment and/or sufficient grid headroom saves costs, avoids congestion, and facilitates low-carbon data centre operations



Integrate data centres in network and system planning

Incentivise the location of data centres in no-regret areas:

- Include data centres and their flexibility potential in European, national and regional network planning
- Provide greater transparency on current and planned grid hosting capacity for all new connections
- Introduce targeted grid connection charges to steer new investments, including data centres, into the right locations
- Policy framework should encourage system-friendly energy procurement, such as on-site generation & BESS, co-located renewables, or locally sourced PPAs

Capability-aligned flexibility requirements and incentives can unlock the flexibility potential of new data centre connections



Establish a transparent and consistent definition of “grid-friendly uses” to inform a legally sound reform of grid connection prioritisation frameworks to overcome the “first-come, first-served” principle for all new connections, including data centres



Ministries, regulators, system operators and data centres could collaborate to harmonise flexible connection agreements (FCAs) for data centres, specifying flexibility requirements for different asset classes while safeguarding uptime, SLA requirements and latency constraints.



Encourage active participation of data centres in electricity markets (day-ahead, intraday, balancing), increase exposure to time-of-use dynamic network charges. Leverage siting flexibility of DCs in planning frameworks to reduce local grid stress.

Access the report



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