Colliers

DATA CENTER

Snapshot
Italy - 2024

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Executive Summary

The global Data Center industry reached unprecedented growth in 2023, hitting $325.9 billion in revenue and projected to grow to $438.7 billion by 2028, driven mainly by the rise of artificial intelligence (AI).

Hyperscale cloud services experienced significant demand, playing a vital role in facilitating AI-driven applications.

Looking ahead, the integration of AI across various industries will intensify reliance on hyperscale cloud providers, leading to increased demand for high-density data centers and expansive campuses. Operators are already reporting substantial growth pipelines for 2024, highlighting AI's pivotal role in shaping the industry's future.

In Italy, evaluating sites for Hyperscale Data Centers now prioritizes factors like electrical power and telecommunication networks over location and latency. Additionally, the rise of EDGE Data Centers is anticipated, necessitating distributed development across Italian regions to alleviate stress on major cities. Innovative cooling technologies, including Direct Liquid Cooling and Immersion Cooling, are gaining traction, promising lower PUE values and improved energy efficiency.

Sustainability goals are pushing data centers towards carbon neutrality by 2030, with initiatives like heat reuse in district heating networks gaining momentum. AI's impact on PUE optimization, coupled with advancements in cooling technologies, is expected to drive further energy efficiency improvements.

Despite challenges, the Italian data center market is succeeding, with Milan emerging as a strategic hub due to its connectivity and available power. However, regulatory constraints and land scarcity are prompting investors to explore alternative locations, driving competition and rising land prices.

Italy is mirroring the European trend, experienced growing demand from both investors and operators trying to get positioned on the most effective locations.

Challenges such as limited land availability within sought-after areas, regulatory constraints, unclear urban development guidelines, and ESG considerations are shifting focus towards brownfield sites. This trend is helping to create positive outcomes on the social structure giving new life to abandoned industrial areas. In addition, AI surging needs are guiding the major hyperscalers to look at alternative locations compared to the most established around Milan.

Global Overview

The global data center industry witnessed unprecedented growth in 2023, setting new records with revenues reaching $325.9 billion, as projected by Statista Market Forecast. With a promising outlook, the industry is poised for further expansion, expected to achieve a market value of $438.7 billion by 2028, driven primarily by the burgeoning influence of artificial intelligence (AI).
Despite its remarkable expansion, the industry faces significant challenges, including escalating capital costs, regulatory concerns, and ensuring efficient power delivery. These factors pose obstacles to sustained growth and operational efficiency, requiring strategic solutions for long-term sustainability.

The emergence of artificial intelligence reached a pivotal moment in 2023, with applications like ChatGPT and Dall-E showcasing AI's multifaceted capabilities in data processing, image generation, workflow optimization, and decision-making enhancement. Notably, ChatGPT achieved a milestone of 100 million users worldwide in just two months, outpacing the growth rate of social media giant Facebook. The demand for hyperscale cloud services, provided by industry giants such as Amazon Web Services, Google Cloud, and Microsoft Azure, experienced a significant surge. These providers play a crucial role in facilitating scalability and computational requirements for AI-driven applications. Their comprehensive offerings, including data storage solutions and robust security measures, make them indispensable partners in digital transformation efforts across various sectors.

Do you know
that a single Google search can power a 100W lightbulb for 11 seconds?
A single ChatGPT session consumes upwards of 50-100 times more power than a single Google Search.

Future Outlook, what's next?

With AI's continued integration into diverse industries, the reliance on hyperscale cloud providers is expected to intensify. Consequently, the demand for high-density data centers and expansive campuses is projected to soar. Some data center operators have already reported a pipeline of one gigawatt for 2024, highlighting the industry's robust growth trajectory and the pivotal role of AI in shaping its future landscape.

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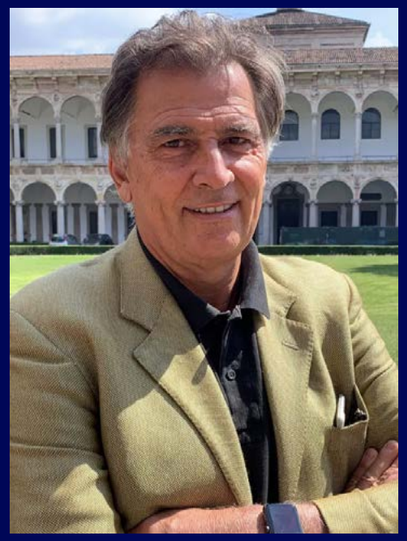

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DBA GROUP

DBA representative in IDA (Italian Data Center Association)
DBA PRO. is DBA Group's operational company that offers Architecture, Engineering, Project Management and ICT services for the design and management of the life cycle of Mission-Critical Infrastructures (MCI). In the MCI sector DBA PRO., positions itself as market-leader in Italy, provides technical consultancy services to design, and supervise the realisation of all types of Data Centers (Hyperscale campuses, Enterprise, Colocation, HPC-AI, Edge Data Centres). Also during the operational phase DBA is able to provide consultancy services and Digital Twins to optimise the O&M processes.
The holding company DBA Group has 1000+ employees totalling an annual revenue of circa 110Mn Euro.

EVIDEN

Eviden is a next-gen technology leader in data-driven, trusted and sustainable digital transformation with a strong portfolio of patented technologies. With worldwide leading positions in advanced computing, security, AI, cloud and digital platforms, it provides deep expertise for all industries in more than 47 countries.
Eviden is an Atos Group company with an annual revenue of c. € 5 billion.

Why Data Centers are changing?

Disruptive technologies are changing the game

The new microprocessor technologies (CPU), graphics cards (GPU), solid-state storage subsystems, high-performance networking subsystems and application areas that take advantage of the AI solutions of recent years have resulted in a substantial review of the design and construction criteria for new data centers used to host these infrastructures.
Specifically, new technologies and the design of new high-density servers, which allow a processing capacity per rack occupancy unit of at least an order of magnitude higher than what was possible just a few years ago, have determined the need to address the design of new data centers in order to efficiently and effectively cool the processing units to exploit the potential of the new architectures. The main purpose is to avoid an excessive waste of energy for cooling and also to allow correct cooling of the critical components, avoiding even localized phenomena of high temperatures with the consequent self-protection effect of the systems (reduction in performance and/or automatic shutdown) to safeguard the components themselves.

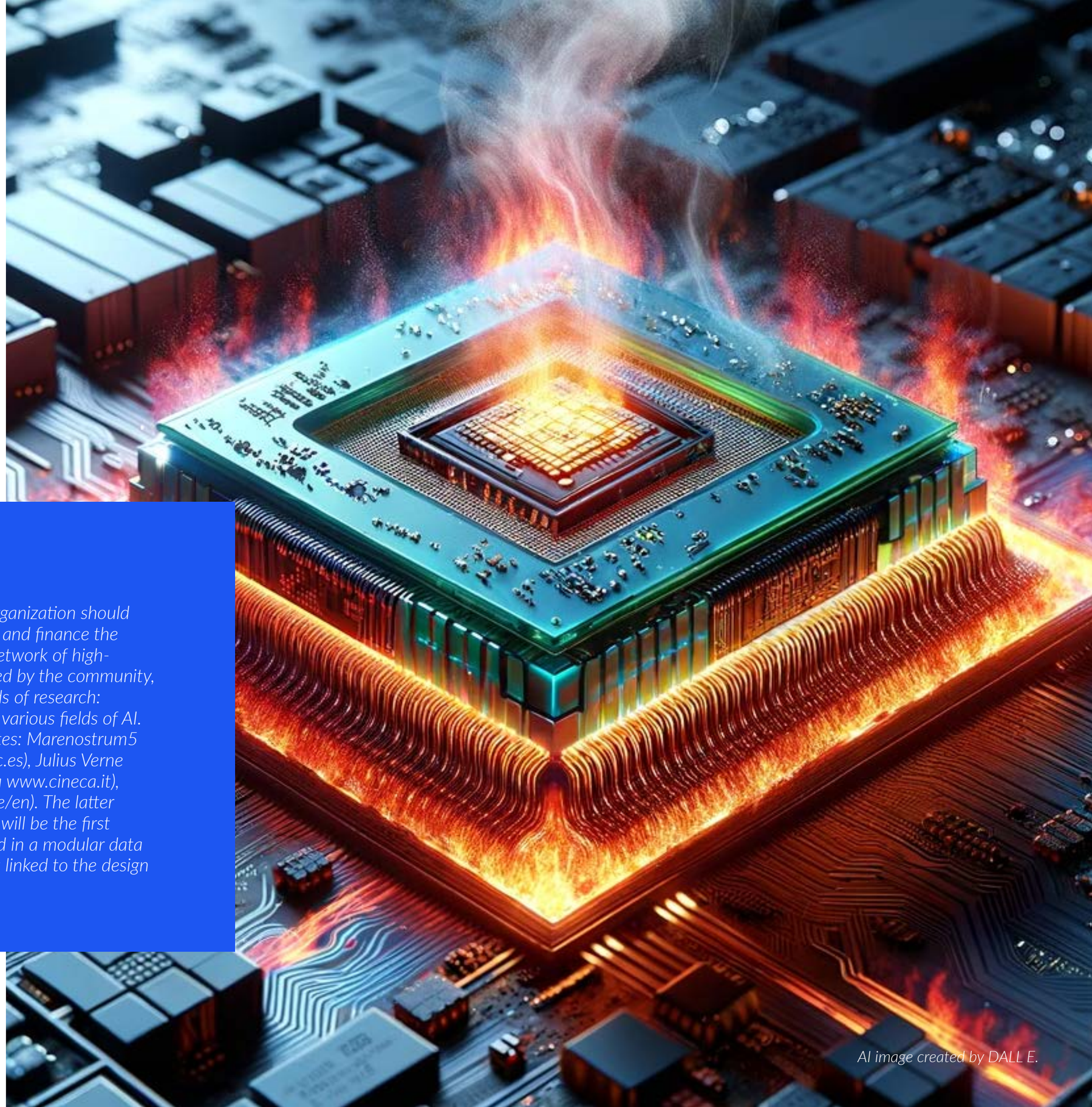
High-consumption and cooling

Currently, a server with high-end GPUs (up to 8) can consume up to approximately 6 kW under intensive load conditions on a size equal to 2U in higher density solutions. Which leads to a consumption per occupied unit of approximately 3kW. If we also add the need to have an adequate computational density per rack (approximately 20 servers in a single rack), it is easy to reach an absorption per rack close to 100kW. This absorption entails the need to have appropriately sized power systems as well as cooling systems that exploit direct liquid cooling solutions, i.e. solutions based on heat sinks where cooling water circulates and which are at least in contact with the hottest components (CPU and GPU). These solutions effectively allow the elimination of approximately 70% of the heat produced for each server via a water circuit tempered at around 35°C. The remaining heat must then be dissipated into the air, which also has a temperature which, in the best cases, can be around 35°C. These solutions however present several drawbacks as the overall energy efficiency hardly determines a PUE lower than 1.2. It goes without saying that in a “green data center”

logic this level of efficiency is not adequate therefore the major manufacturers have introduced processing systems where direct water cooling is extended to almost all the “hot” components of the servers and the interconnection network to guarantee cooling with a tempered water circuit above 95%. In this situation we speak of “data center neutral” systems as the air circulation no longer has the purpose of cooling but only of providing adequate air exchange in the room and also allowing for human activities due to system maintenance. In such configurations, a PUE (Power Usage Effectiveness) <1.1 is often achieved.

HPC IN EUROPE

At European level, the EuroHPC Joint Undertaking organization should be mentioned, which has as its main aim to promote and finance the European AI&HPC sector to provide Europe with a network of high-performance computing systems that can be accessed by the community, researchers and development groups in different fields of research: physics, chemistry, natural sciences, engineering and various fields of AI. It is important to mention the four main European sites: Marenostrum5 in Spain (Barcelona Supercomputing Center www.bsc.es), Julius Verne in France (CEA www.cea.fr), Leonardo in Italy (Cineca www.cineca.it), JUPITER in Germany (Julich https://www.fz-juelich.de/en). The latter in particular will be installed at the end of 2024 and will be the first European Exascale system also designed to be hosted in a modular data center, a further technological challenge beyond that linked to the design and implementation of the calculation system.



AI image created by DALL E.

What operators are looking for?

Key paradigms for Data Centers sites in Italy

Evaluating a site for the construction of a Hyperscale Data Center campus in Italy has seen methods and best practices now known to industry insiders. This new AI wave, whose arrival we are now witnessing, significantly modifies the requirements and requests of operators interested in developing new HPC Data Centers.
The locations (Milan/Rome) and latencies seem to be objectives of secondary importance compared to those of electrical power (greater by 5 or 6 times for the same buildable area), telecommunication network and the proximity between sites dedicated to supercomputing and users who will exploit the potential of AI applications.

AI image created by DALL E.

How an AI infrastructure works

Recent developments in Data Center infrastructure, primarily driven by cloud computing, video streaming, and 5G networks, are insufficient for the emerging demands of Artificial Intelligence (AI). Major hyperscale operator (e.g. Microsoft, Amazon Web Services, Google, Meta, etc.) and Data Center developers, are adapting their strategies and infrastructures to cater to AI's intensive data-processing needs. AI's digital infrastructure can be imagined like a human brain, or better a "digital brain" organized into two different hemispheres or lobes. The first one, the "training lobe", certainly the more powerful of the two, handling immense computational tasks like processing vast data points to learn and reorganize them in a model. It applies a continuous teaching to absorb a whole universe of information. The other one, the "response lobe" supports interactive generative platforms that field your queries, tap into the modelled database and respond you in a convincing human syntax.

The rise of EDGE Data Centers

With these paradigms, in addition to continuing to see the construction of campuses in major Italian cities, there should be a significant increase in the demand for EDGE Data Centers with greater power and size characteristics compared to what we observe in the market of these recent years. Valuing new development areas by distributing requests across all Italian regions could be a valid key to ensure the needs for electrical power and fibre optic connections, avoiding further stress on cities that have been most exploited over the last few years.

A new model for Data Centers

The power density necessary to operate the new IT solutions (about 40 - 60 kW / rack) dedicated to High Performance Computing (HPC) solutions dedicated to research, digital twins, AI and all the applications required by supercomputing, necessitate the adoption of an optimized and innovative Data Center design model based on new solutions for: layout of the white spaces, cooling systems, piping and distribution, temperature and flow control, rack design, Building - Energy - DC infrastructure Management Systems.

AI image created by DALL E.

AI image created by DALL E.

Cooling infrastructures for HPC Data Center could be realized through these main solutions:

- *Direct Liquid Cooling | utilizes circulating liquids to remove heat from internal hardware electronics efficiently. This method can transfer large volumes of heat in small spaces, but it typically focuses on cooling the CPU or GPU. As a result, additional air conditioning is often required to cool other components, contributing to the overall cooling load and hence raising the Power Usage Effectiveness (PUE).*

- *Immersion Cooling | goes beyond cooling just the CPU or GPU. It cools other components on the printed circuit board (PCB) or motherboard as well. Immersion cooling is gaining popularity due to its ability to support higher power density and achieve lower PUE in HPC environments. Unlike liquid cooling, which targets specific components, immersion cooling effectively lowers the temperature of the entire board where these components are mounted.*

Also, there are other cooling systems such as close-coupled cooling, which places the air conditioner as close as possible to the heat-generating unit (e.g. server racks), allowing for a more efficient cooling.
The market for new technologies dedicated to liquid solutions, particularly Immersion Cooling, must evolve and innovate to ensure massive usage that keeps pace with the rapid growth of the HPC Data Center market. It must provide not only high-performing and efficient solutions aimed at maximizing the reduction of the PUE of the infrastructure but also ensure that these solutions can be easily operated and maintained by the operators currently in the sector in Italy.

The future of Data Center

The growth of the market related to AI applications and therefore the adaptation of new or existing Data Center infrastructures is certainly not a clear path. The methods of realization of Data Centers that host devices with a power density equal to or greater than 15/20 kW per rack, require the adoption of solutions that mainly allow for sustainable and minimally invasive interventions, but still useful in guaranteeing both colocation needs, and the main and most urgent needs related to the functioning of the first AI applications. The adoption of flexible and hybrid design/ construction solutions, with the adoption of air and liquid cooling systems, could guarantee the coexistence within the same site of devices dedicated both to colocation services and to the first AI services that the market may require already during 2024. Such solutions, moreover, are those that could allow operators in the sector to update and implement some of the existing infrastructures, giving them a new life and thus revaluing their own assets.

Sustainability goals and the impact on owners and operators

Data centers need to become more sustainable and energy-efficient. The final goal is to be carbon-neutral by 2030 (EU Commission). Moreover, the data centre industry, crucial due to rising digitalisation, faces the challenge of high electricity usage for IT and cooling systems. Under the revamped Energy Efficiency Directive, in force since 10-10-2023, owners and operators of data centres with a minimum installed IT capacity of 500 kW must disclose their energy performance: 2023 data must be reported by 15 May 2024.

Heat reuse is a necessary choice

One of the potential solutions to achieve 2030 targets, will be to adopt a circular economy approach by reusing waste heat from data centres in district heating networks or in other systems that can reuse it (agriculture and greenhouses, swimming pools and sport centres, stadia, etc). However, the potential of low-temperature waste heat, typical in case of a data centre with low IT power density (colocation DC), is largely untapped, necessitating further research and innovative solutions to optimize its use. The main obstacles to heat recovery implementation are the absence of a clear and frequently used business model, rather than technical problems. Opportunities lie in enhancing sustainability by replacing resources with excess heat. Municipalities, and their directly or indirectly owned energy management companies, play a crucial role in integrating waste heat into district heating systems through planning and initiatives like those ongoing in Milan, with the involvement of A2A.

AI image created by DALL E.

AI Impact on PUE

The average PUE (the ratio of the total amount of energy used by a Data Center to the energy delivered to computing equipment) for cloud computing, video streaming and 5G networks ranges today between 1,3 and 1,5. Thanks to new cooling technologies (liquid or immersive cooling) and their performance, as well as the overall optimization of Data Center equipment for needs related to HPC and AI, the PUE values could be optimized down to very low thresholds of about 1.1. Furthermore, thanks to AI applications that utilize machine learning algorithms and digital twin solutions that together guarantee constant control, continuous optimization, the definition of strategies for the evolution of infrastructures and their consumption, it is possible to influence the optimization of the PUE of future Data Centres directly and further.

Italian Data Center Market Overview

European Market Dynamics:

In the European market, take-up of data center capacity totaled 601MW across the 14 largest markets in 2023, marking a 10% increase from the previous year. Simultaneously, the delivery of new supply amounted to 561MW, reflecting a 2% uptick from 2022. This discrepancy between take-up and supply is notable, occurring for the second time in five years.
Cities such as Frankfurt, London, Amsterdam, Paris, and Dublin experienced a pronounced demand-supply imbalance, highlighting the concentration of data center activities in these key hubs. Notably, the fourth quarter witnessed a significant surge in take-up, driven by prelet capacity in Dublin, London, and Paris, underscoring the dynamic nature of the European data center market.

What about Italy?

The Italian Data Center market, following the European trend, is recording a surging demand from both investors and operators trying to get positioned on the most effective locations (e.g. available power, reduced latency, connectivity).
Italy, and in particular Milan, has a strategic position in Europe for both distributing and receiving content thanks for its connectivity and sub-marine backbone connections.

Due to the scarcity of land available within the restricted areas currently demanded by data center operators, we are witnessing a shift on land researches. Regulatory constrains, the lack of clear urbanistic guidelines on developments as well as ESG targets, are pushing investors/operators to seek brownfields rather than greenfields. This trend is helping to create positive outcomes on the social structure giving new life to abandoned industrial ares.

In addition, AI surging needs are guiding the major hyperscalers to look at alternative locations compared to the most established around Milan where they could obtain more power and business scalability.
Guided by all the trends mentioned as well as the robust competition among Data Center players, land prices on critical areas are rising fast towards the more established levels recorded in the ***FLAP-D countries***.
The latter, in some cases, is guiding investors to take additional risks or seeking for alternative solutions in order to make their investments more doable.

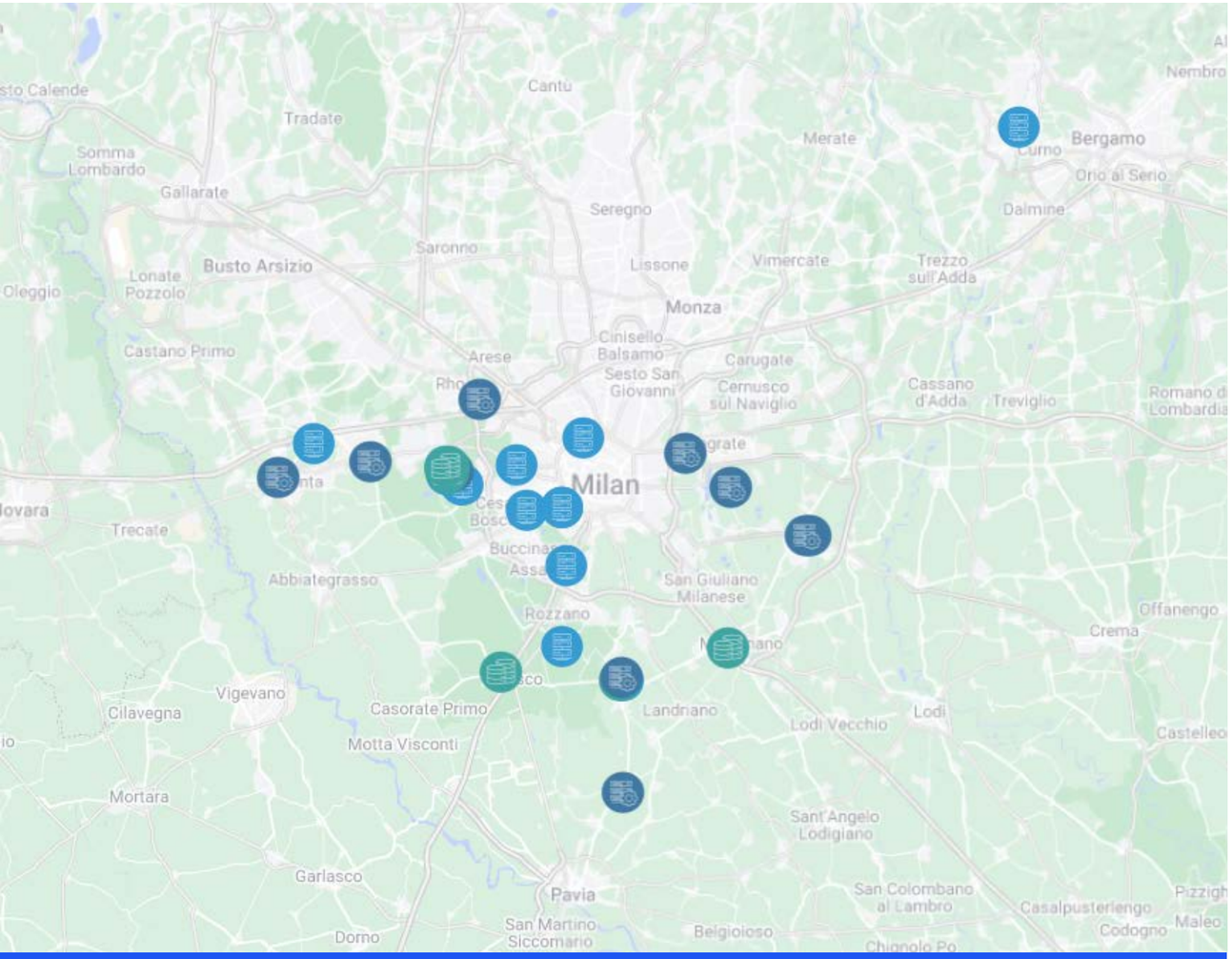
The acronym "FLAP" refers to Frankfurt, London, Amsterdam, Paris

Milan Metropolitan Area

Milan is currently the most sought-after area in Italy due to its strategic location and good connectivity, with currently circa 500 MW between already built data centers or under construction projects with a further pipeline of about approx. 700 MW
Historically, in Milan, the majority of the supply, both operating and in pipeline, is located in the southern and western side of the city where there is the interconnection of various internet backbones as well as the renowned MIX (one of the Italian main IXPs). However, the scarcity of product, the difficulties in securing a robust power and tougher regulations are leading hyperscalers to re-think their positioning strategies looking at alternative locations.

Currently, focusing on the main operators and the most important projects in Milan, there are a total of 22 data centers, 14 existing and 8 under construction. On top these, other additional 10 potential DC developments are secured accounting for a substantial pipeline.

Among the main players we recorded Aruba, AWS, Microsoft, Compass, Stack, Vantage, Data4/Brookfield, Equinix, Supernap, Irideos, BT, Tim, and Vodafone.



n°35
DATA CENTER

650 MW
POWER SUPPLY*

900 MW
SECURED PIPELINE**

*Built and Under Construction
** Land Secured by institutional players and in the phase of getting all the required permission to start the construction

A few of the most relevant operators in Italy

STATUS	MUNICIPALITY	PROVINCE	OPERATOR	GLA (SQM)	POWER (MW)
Built	Santo Stefano Ticino	Milano	Tim	20.000	20
Built	Ponte San Pietro	Bergamo	Aruba	200.000	60
Built	Siziano	Milano	Stack	42.000	40
Built	Cornaredo	Milano	Data4/ Brookfield	27.000	60
Built	Pero	Milano	Verizon	18.500	25
Built	Settimo Milanese	Milano	British Telecom	30.000	16,5
Under Construction	Tiburtina	Roma	Aruba	52.000	30
Under Construction	Siziano	Milano	Stack	40.000	35
Under Construction	Noviglio	Milano	Hines/Compass	115.607	100
Under Construction	Cornaredo	Milano	Equinix	18.565	20
Under Construction	Cornaredo	Milano	Equinix	12.500	15
Under Construction	Cornaredo	Milano	Vantage	20.160	25
Under Construction	Melegnano	Milano	Vantage	48.000	64
Under Construction	Cornaredo	Milano	Data4/ Brookfield	20.765	20
Under Construction	Cornaredo	Milano	Equinix	30.000	30
Under Construction	Roma	Roma	RaiWay	50.000	40
Under Construction	Caserta	Caserta	Data for Med	60.000	22

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