Artificial Intelligence

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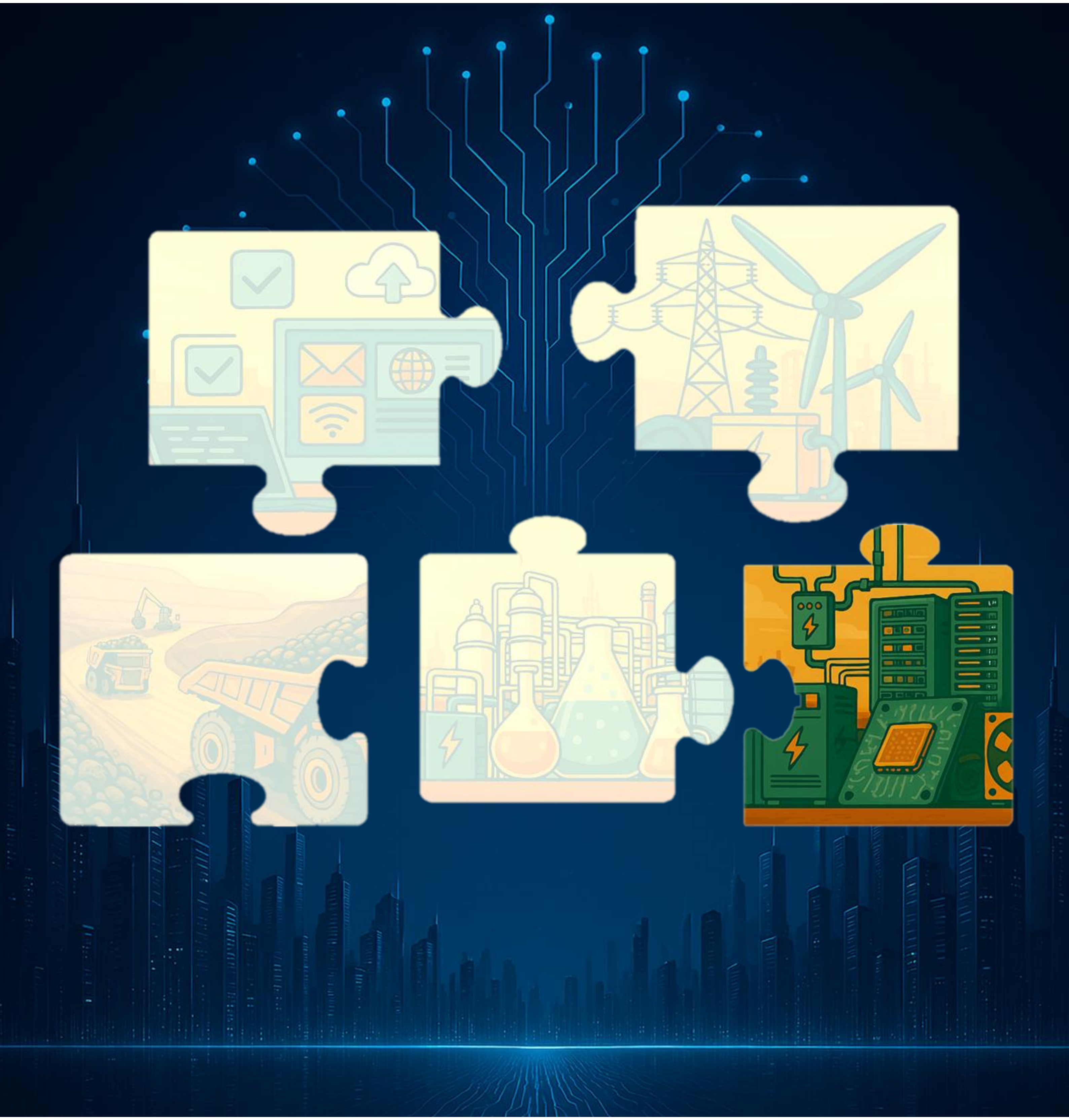
Thematic



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April 16, 2026

Powering AI Supercycle: Decoding Data center capex

Quick Pointers

- India emerging as a cost-competitive hub (20-30% cheaper) with ~3x capacity expansion and ~INR1.5trn investment for data center (DC)
- Electrical ecosystem capturing a large share (~40-45%) of the total data center cost

In our AI series, this piece deep dives into the **structural opportunity unfolding for the capital goods ecosystem in data center**, driven by accelerating investments in digital infrastructure. Data centers are rapidly becoming the **backbone of the digital economy**, supporting cloud, AI, and real-time data processing. As compute demand scales exponentially, the underlying **infrastructure intensity, particularly power and electrical systems, is rising sharply**, creating a large and underappreciated opportunity for capital goods companies.

India's data center (DC) capacity is expected to grow **~3x from ~1.1GW to ~3.4GW by 2030**, translating into a **INR1.5trn capex opportunity by FY30**. Unlike traditional infrastructure, data centers **are power-intensive, high-reliability assets**, with electrical systems accounting for **~40-45% of total capex**. As a result, the ongoing build-out is effectively translating into a **power infrastructure investment cycle**, directly benefiting players across transformers, switchgear, UPS systems, gensets, and cables.

Electrical systems account for **~40-45% of total data center capex**, translating into an estimated **~INR750bn addressable opportunity** within India's ~INR1.5trn DC investment pipeline. The opportunity is well-diversified across multiple segments, driven by **gensets (~9%; INR135bn)**, **cables (~8%; INR120bn)**, and **switchgear (~6%; INR90bn) and UPS & batteries (~15% of total capex; INR224bn)**.Transformers (~5%), PDUs (~4%), and PSUs (~3%) constitute the remaining opportunity, collectively benefiting from rising power intensity, redundancy requirements, and increasing deployment of high-density racks.

In this report, we assess the **opportunity for the capital goods ecosystem** from India's accelerating data center build-out, with companies such as **ABB India, Siemens Energy, CG Power, GE Vernova T&D, Hitachi Energy India, Cummins India, Schneider Electric, Vertiv India, Siemens, Larsen & Toubro, and Apar Industries**, well-positioned to benefit from rising demand for power and infrastructure solutions. We believe these players are poised to gain from a **structural, multi-year capex cycle** driven by hyperscale and AI-led demand, with India unlocking **~INR1.5trn opportunity** over the next 5 years, supported **by localization and increasing investments**. However, execution will depend on progress in power availability, grid connectivity, and infrastructure readiness.

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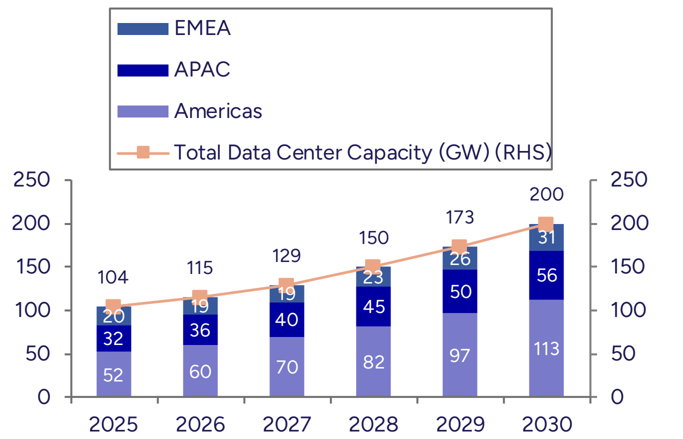
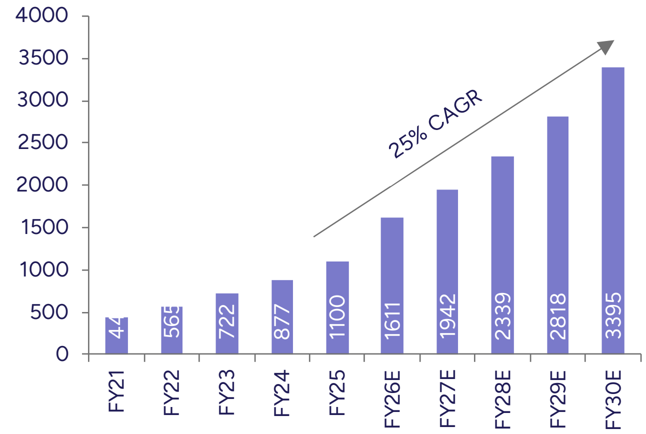
Thematic Insights in Charts

Exhibit 1 : Global data center capacity to double by 2030



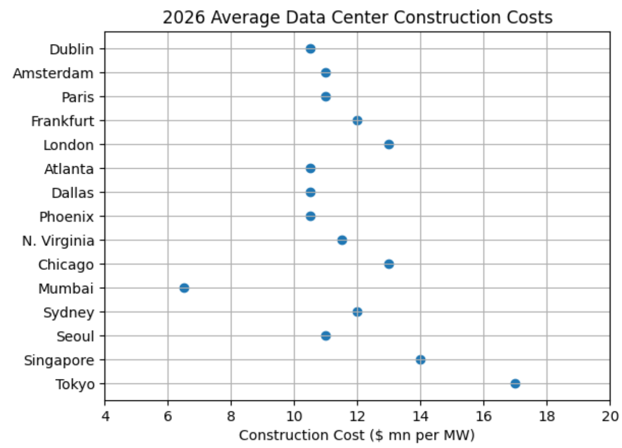
Source: Industry, PL

Exhibit 2 : India data center capacity to increase by ~3x by FY30E



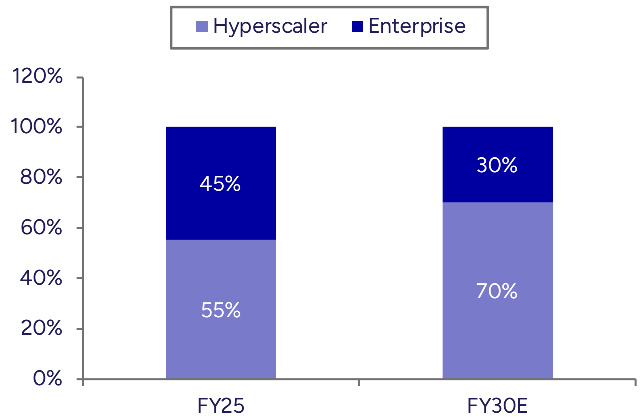
Source: Industry, PL

Exhibit 3 : India offers 20-30% lower DC construction costs



Source: Industry, PL

Exhibit 4 : Hyperscale wave reshaping DC demand mix



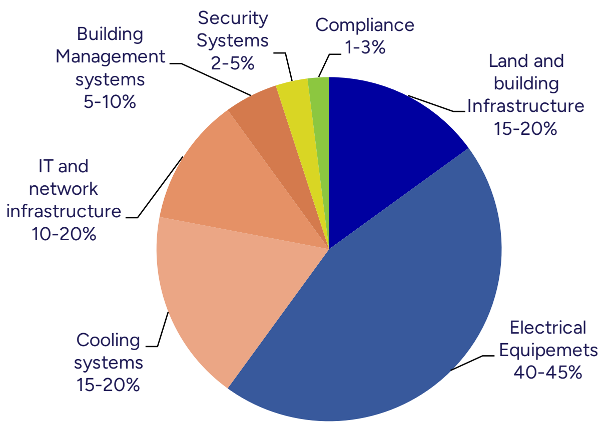
Source: Industry, PL

Exhibit 5 : Rs1.5trn investment expected in data centers by FY30E

Parameter	Value
Data center setup cost (earlier)	Rs400–450 mn per MW
Data center setup cost (current)	Rs600–700 mn per MW
Capacity addition expected by FY30	~2,300 MW
Total capex implied (FY30)	~Rs1.5 trn

Source: Industry, PL

Exhibit 6 : Electrical equipment dominates the cost mix (~40–45%)



Source: Industry, PL

Exhibit 7 : Who Gains? DC Cost Pool and Listed Player Mapping

Cost Component	% of total cost	Listed Players- India	Listed Players - Global
Land and building Infrastructure	~15-20%	LT, Techno Electric & Engineering, Anant Raj	AECOM, Turner Construction, Skanska
Electrical systems	~40-45%	ABB, Hitachi Energy, CG Power, Cummins, Voltamp, GE Vernova T&D, Siemens Energy, KOEL, TDPS, Schneider electric India	Schneider Electric, Eaton, Vertiv, ABB, GE Vernova
Cooling systems	~15-20%	Blue Star, Voltas, Thermax (Cooling products & Utilities), Johnson Controls India, Vertiv India	Carrier Global, Trane Technologies, Johnson Controls
IT and network infrastructure	~10-20%	Tejas Networks, HFCL, Apar Industries Polycab, KEI Industries, Finolex Cables	Cisco, Arista Networks, Juniper Networks
Building management systems	~5-10%	Honeywell Automation India, Siemens India	Honeywell, Schneider Electric, Johnson Controls
Security systems	~2-5%	CP Plus and Honeywell India	Johnson Controls (Tyco), Axis Communications
Compliance and certification	1-3%	SGS India	SGS SA, Bureau Veritas, Intertek Group

Source: Industry, PL

Exhibit 8 : Electrical Systems Opportunity from Data Center Capex Build-Out

Particulars	% of total DC cost	FY26E	FY27E	FY28E	FY29E	FY30E	Total (Rs bn)	Key beneficiaries' players
DC capacity additions (MW)		511	331	397	479	577		
Estimated cost (INR bn)		307	199	238	287	346	1500	
Electrical systems cost								
Gensets (INR bn)	~9%	28	18	21	26	31	134	Cummins India, KOEL, Caterpillar, MTU
Transformers (INR bn)	~5%	15	10	12	14	17	75	GE Vernova T&D, Hitachi Energy, Siemens Energy, Voltamp, Atlanta Electricals, CG Power
Switchgears (INR bn)	~6%	18	12	14	17	21	90	ABB India, Siemens, Schneider Electric, GE Vernova, Hitachi Energy, Legrand and Eaton
UPS (Uninterrupted Power supply) and batteries (INR bn)	~15%	46	30	36	43	52	224	Vertiv India, Schneider Electric, Eaton, ABB, Delta Electronics, Huawei Technologies, Exide India
Power distribution Units (INR bn)	~4%	12	8	10	11	14	60	ABB India, Schneider Electric, Vertiv, Eaton, Legrand, Rittal India
Power supply units (INR bn)	~3%	9	6	7	9	10	45	Delta Electronics, Schneider Electric, Siemens and Eaton
Cables (INR bn)*	~8%	25	16	19	23	28	119	Apar Industries, Polycab India, KEI Industries, Finolex Cables, RR Kabel, Sterlite Technologies (data cables/fiber)

Source: Industry, PL

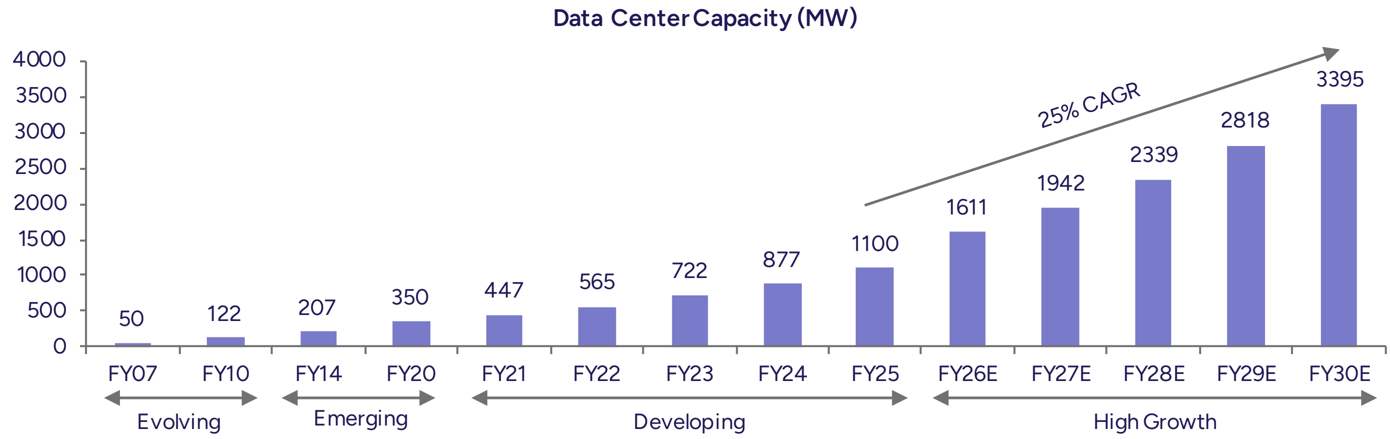
India Data Centers: The backbone of India's trillion-dollar digital ambition

India's DC industry is entering a structural expansion phase, emerging as a critical backbone for the country's trillion-dollar digital economy ambitions. Historically constrained to small, enterprise-led server infrastructure, DC development has now evolved into a strategic priority, supported by **favorable policy initiatives** and **rising digital consumption**. A combination of structural drivers including the world's largest **data-intensive mobile user base**, **rapid 5G rollout**, **data localization mandates**, and the **accelerating adoption of AI and IoT** is driving a step-change in demand for scalable, high-density data center infrastructure.

Against this backdrop, industry estimates indicate a strong capacity build-out pipeline. India's installed DC capacity is expected to scale from **~1,100MW currently to ~1,600MW by 2026**, with a further ramp-up to **~3.4GW by 2030 (~3x growth)**, translating into **~INR1.5trn capex opportunity**.

This growth is underpinned by increasing compute intensity, particularly from AI and GenAI workloads, which are driving higher power density and efficiency requirements, alongside continued **traction in cloud adoption and enterprise digitalization**. Overall, the sector is poised for a multi-year investment upcycle, with strong demand visibility and meaningful opportunities across the broader ecosystem, including power infrastructure, cooling solutions, and EPC players.

Exhibit 9 : Domestic data center capacity to register ~25% CAGR over FY25-30E



Source: Industry, PL

Over the years, cost of setting up a data center has gone up significantly from **INR400-450mn per MW** to **INR600–700mn per MW**. For **~2300MW capacity addition by FY30**, total capex required would be **~INR1.5trn over FY25-30**.

Exhibit 10 : INR1.5trn capex planned during FY25-30E for data center

Parameter	Value
Data center setup cost (earlier)	INR400–450mn per MW
Data center setup cost (current)	INR600–700mn per MW
Capacity addition expected by FY30	~2,300MW
Total capex implied (FY30)	**~INR1.5trn**

Source: Industry, PL

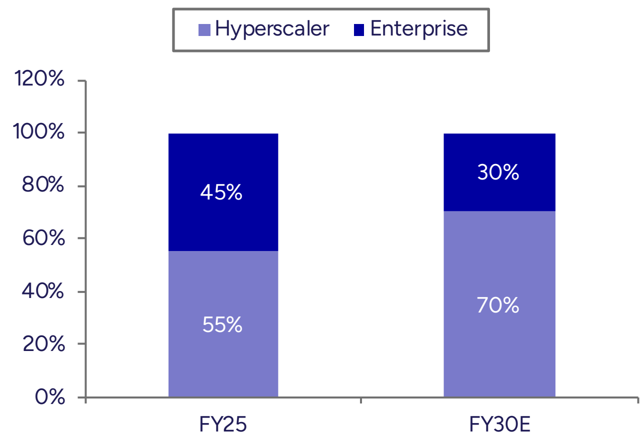
Hyperscalers dominate India's data center

Hyperscalers dominate India's DC demand, accounting for ~55% of capacity in FY25, and are expected to be the key growth driver, with demand projected to grow at **34–42% CAGR over FY25–30E**, increasing their share to **65–70% by FY30**. Growth will be **driven by rising cloud adoption, data localization requirements, and increasing AI-led workloads**. Policy support (ease of approvals, power availability, pre-approved land) and strong participation from global cloud players are further accelerating investments. Additionally, emerging demand from LLMs related AI-native companies presents a potential long-term upside, contingent on compute and power availability.

Enterprise demand remains robust but will see share moderation, contributing ~45% in FY25, and is expected to grow at **~24% CAGR over FY25–30**, with share declining to **30–35% by FY30** due to faster hyperscaler ramp-up. Enterprises are increasingly adopting **colocation and hybrid cloud models** to optimize costs, enhance scalability, and ensure compliance.

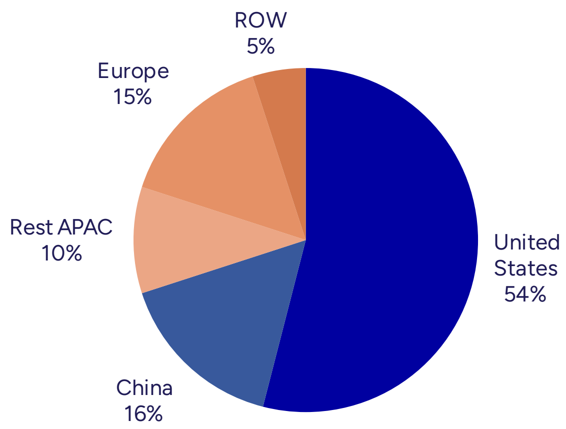
Within enterprises, **BFSI (~39%) and technology (~27%) lead demand**, supported by digital transactions, regulatory requirements, and platform scaling. Retail & e-commerce, telecom, media, and government segments are also witnessing steady traction, driven by rising digital consumption, 5G rollout, and e-governance initiatives.

Exhibit 11 : Hyperscaler share to increase to 70% by FY30E in India



Source: Industry, PL

Exhibit 12 : Share of end-user segments in enterprise DC demand – India



Source: Industry, PL

India offers structural cost advantage amid global cost escalation

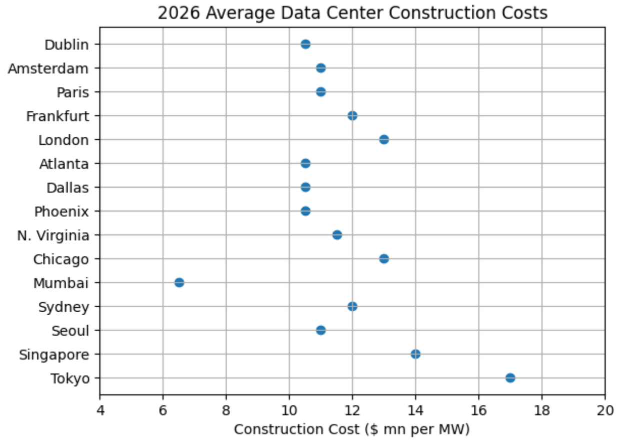
- Global data center industry is witnessing sharp cost inflation, driven by supply-demand imbalances, longer lead times, shortage of skilled labor, and rising input costs. Average construction costs have increased from **~$7.7mn/MW in 2020 to ~$10.7mn/MW in 2025 (7% CAGR)**, with a further **~6% YoY increase expected in 2026 (~$11.3mn/MW).**

- In contrast, **India continues to offer a meaningful cost advantage**, with data center setup costs at **~INR600–700mn/MW ($7.0–8.5mn/MW)**, compared to **INR400–450mn/MW earlier**.

- Despite rising costs domestically, **India remains 20–30% cheaper** Vs global benchmarks, reinforcing its attractiveness as a data center investment and capacity expansion hub.

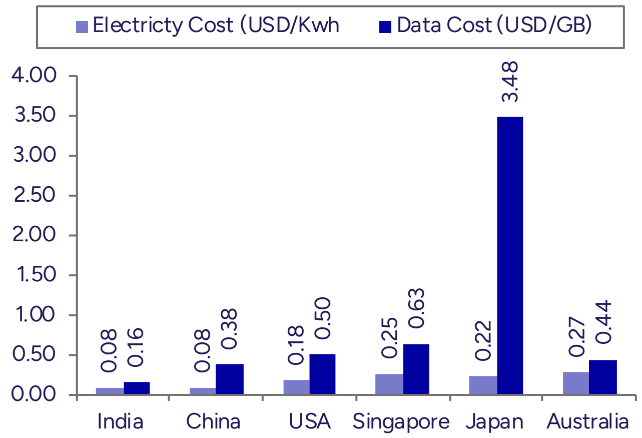
- While speed-to-power remains the key driver for site selection globally, followed by latency and proximity to end-users, cost differentials are becoming increasingly critical as project sizes scale up, positioning India favorably in global allocation decisions.

Exhibit 13 : Data center cost per MW remains the lowest in Mumbai



Source: Industry, PL

Exhibit 14 : India's electricity & data costs lower than most countries



Source: Industry, PL

Structural tailwinds accelerating India's data center opportunity

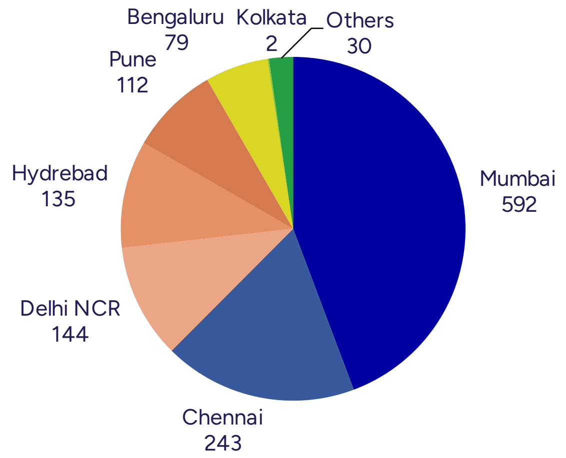
- **Digital consumption scaling up:** Wireless data usage has doubled over 2020–25 to ~22GB/month, indicating sustained growth in data intensity and storage requirements.
- **Strong user growth visibility:** Internet user base expanded ~3x (0.3bn to ~0.97bn) over 2020–25. 5G penetration stood at ~35% (Mar'25) with total subscribers expected to exceed ~1.3bn by 2030, underpinning long-term demand.
- **AI-led incremental demand:** Rising adoption of GenAI and HPC is driving incremental capacity needs; government push via IndiaAI Mission 2024 (~INR103bn capex) further strengthens ecosystem buildout.
- **India's cost leadership intact:** India remains among the most cost-efficient markets globally with **lower construction costs (~$7mn/MW)** and **competitive power tariffs (~$0.08/kWh)** vs. developed peers, supporting superior project IRRs.

Mumbai remains centric core for DC with multi-city expansion underway

India's DC capacity remains highly concentrated across a few key metro clusters, led by Mumbai, Chennai, Delhi-NCR, and Hyderabad, which together account for the bulk of **installed (>~65%)** and upcoming capacity. **Mumbai** continues to dominate **(~50% share)** driven by its status as the country's financial hub, dense subsea cable landings, and strong enterprise demand. Chennai is emerging as a key gateway hub benefiting from multiple cable landing stations and lower latency advantages, while Delhi-NCR serves as the largest consumption-driven market supported by government, BFSI, and enterprise demand. Hyderabad has gained strong traction led by hyperscaler investments, proactive state policies, and availability of large land parcels.

Beyond these core markets, Pune and Bengaluru are witnessing rising traction as spillover destinations, supported by improving infrastructure and proximity to enterprise clusters, while Kolkata and other Tier-II cities remain nascent but strategic from a latency and edge DC perspective.

Exhibit 15 : ~65% of data centers are located in 6 regions within India (MW)



Source: Industry, PL

Data center capex landscape: India and global players beneficiaries

- Data center capex is power- and infrastructure-heavy, with cost per MW being the key benchmark, typically driven by **land, power availability, cooling systems, and redundancy requirements**.
- India remains cost-competitive vs. global markets, supported by **lower construction and labor costs**, although power infrastructure and land constraints can elevate costs.
- Capex intensity is rising globally due to AI workloads, higher rack densities, and advanced cooling (liquid/immersion) requirements.
- The value chain is broad spanning EPC, electrical equipment, cooling, and backup power making several Indian listed players indirect beneficiaries of the DC build-out.
- In contrast, global markets have scaled pure-play data center operators, benefiting from annuity-like revenues and higher utilization levels.

Exhibit 16 : DC cost structure and key ecosystem players

Cost Component	% of total cost	Listed Players- India	Listed Players - Global
Land and building Infrastructure	~15-20%	LT, Techno Electric & Engineering, Anant Raj	AECOM, Turner Construction, Skanska
Electrical systems	~40-45%	ABB, Hitachi Energy, CG Power, Cummins, Voltamp, GE Vernova T&D, Siemens Energy, KOEL, TDPS, Schneider electric India	Schneider Electric, Eaton, Vertiv, ABB, GE Vernova
Cooling systems	~15-20%	Blue Star, Voltas, Thermax (Cooling products & Utilities), Johnson Controls India, Vertiv India	Carrier Global, Trane Technologies, Johnson Controls
IT and network infrastructure	~10-20%	Tejas Networks, HFCL, Apar Industries Polycab, KEI Industries, Finolex Cables	Cisco, Arista Networks, Juniper Networks
Building management systems	~5-10%	Honeywell Automation India, Siemens India	Honeywell, Schneider Electric, Johnson Controls
Security systems	~2-5%	CP Plus and Honeywell India	Johnson Controls (Tyco), Axis Communications
Compliance and certification	1-3%	SGS India	SGS SA, Bureau Veritas, Intertek Group

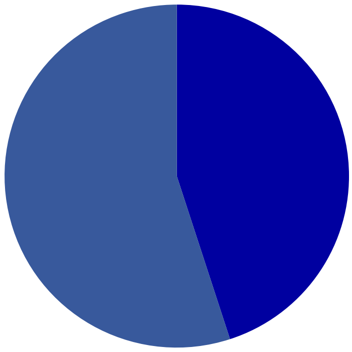
Source: Industry, PL

Electrical equipment: The core value capture pool in DC capex

- Electrical systems account for **40–45% of total data center capex**, making them the **single largest cost bucket**, ahead of civil and cooling in most data center builds.

- The share has structurally increased over the last few years, driven by: higher power densities (kW/rack) due to AI/ML workloads, increasing redundancy requirements (N+1 / 2N architecture), and focus on uptime (Tier III / IV standards).

Exhibit 17 : Electrical equipment remains largest value pool (~40-45%)



Source: Industry, PL

Exhibit 18 : Rs1.5trn addressable market opportunity for data center players over next 5 years

Particulars	% of total DC cost	FY26E	FY27E	FY28E	FY29E	FY30E	Total (Rs bn)	Key beneficiaries' players
DC capacity additions (MW)		511	331	397	479	577		
Estimated cost (INR bn)		307	199	238	287	346	1500	
Electrical systems cost								
Gensets (INR bn)	~9%	28	18	21	26	31	134	Cummins India, KOEL, Caterpillar, MTU
Transformers (INR bn)	~5%	15	10	12	14	17	75	GE Vernova T&D, Hitachi Energy, Siemens Energy, Voltamp, Atlanta Electricals, CG Power
Switchgears (INR bn)	~6%	18	12	14	17	21	90	ABB India, Siemens, Schneider Electric, GE Vernova, Hitachi Energy, Legrand and Eaton
UPS (Uninterrupted Power supply) and batteries (INR bn)	~15%	46	30	36	43	52	224	Vertiv India, Schneider Electric, Eaton, ABB, Delta Electronics, Huawei Technologies, Exide India
Power distribution Units (INR bn)	~4%	12	8	10	11	14	60	ABB India, Schneider Electric, Vertiv, Eaton, Legrand, Rittal India
Power supply units (INR bn)	~3%	9	6	7	9	10	45	Delta Electronics, Schneider Electric, Siemens and Eaton
Cables (INR bn)*	~8%	25	16	19	23	28	119	Apar Industries, Polycab India, KEI Industries, Finolex Cables, RR Kabel, Sterlite Technologies (data cables/fiber)

Source: Industry, PL **Part of Network Infrastructure*

Based on our understanding and research, the ~2300MW incremental data center capacity addition is expected over FY25–30E translates into a sizable and sustained opportunity for the **capital goods sector**, particularly across **electrical equipment and power infrastructure**. The spend intensity across segments such as **UPS & batteries, gensets, switchgear, and transformers** is likely to drive strong order inflows and revenue visibility for companies operating in these categories. Given the criticality of uptime and redundancy in data centers, demand is skewed toward high-spec, reliable, and often premium solutions, supporting better realizations and margin profiles for established players.

In our view, the data center theme represents a **structural, multi-year growth drive** for capital goods companies, complementing existing opportunities in T&D, industrial capex, and energy transition. Companies with **strong execution capabilities, technological tie-ups, and presence across multiple segments of the electrical value**

chain are best positioned to benefit. Additionally, the increasing shift toward hyperscale and AI-driven data centers is likely to further enhance demand for higher capacity and more efficient equipment, reinforcing long-term growth visibility.

AI- Led power intensity: A structural Tailwind

Rising power density: The core demand multiplier

The evolution of data center workloads from traditional enterprise IT to cloud and now AI/GenAI—has led to a step-change in power intensity per rack, fundamentally altering infrastructure requirements.

Traditional data centers typically operated at **~5–8 kW per rack**, which increased to ~**10–15 kW** in cloud environments. However, AI-led deployments are now pushing densities to **~25–40 kW per rack**, driven by GPU-intensive workloads and high-performance computing needs.

Exhibit 19 : **AI workloads driving 5x increase in power density**

Type	Avg kW per rack
Traditional DC	5-8 kW
Cloud DC	10-15 kW
AI DC	25-40 kW

Source: Industry, PL

This sharp increase in power density has direct implications for electrical infrastructure, including:

- Higher capacity transformers and switchgear
- Increased deployment of UPS systems per rack
- Greater requirement for Power Distribution Units (PDUs)

Redundancy requirements: Reliability driving equipment multiplication

Data centers particularly **Tier III and Tier IV facilities** are designed to ensure **near-zero downtime**, making redundancy a critical design principle.

Unlike traditional infrastructure, DCs require multiple layers of backup and parallel systems, which significantly increases electrical equipment intensity.

Key redundancy-driven requirements include:

- N+1 / 2N transformer configurations
- Multiple parallel UPS systems for uninterrupted power supply
- Dual power feeds and switchgear systems
- Extensive deployment of backup generators (diesel/gas-based)

This results in duplication of critical electrical infrastructure, effectively increasing equipment demand per MW of capacity.

To assess how the data center opportunity is translating at a company level, we analyse recent management commentary across key capital goods players. The commentary indicates that demand is gaining traction across core electrical segments such as transformers, switchgear, and backup power, with select players already witnessing order inflows and improving pipeline visibility. The following exhibit maps listed players based on their product offerings, exposure to data centers, and key takeaways from recent interactions.

Exhibit 20 : Capital Goods companies with offered products and services for data centers and their recent commentary

Company	Products Supplied to Data Centers	Data Center contribution	Comments
Transformers & Switchgear			
Hitachi Energy India	GIS substations, transformers	High-single digit of order book	~15% addressable market of the total data center cost. Executing export orders in SEA
Siemens Energy	Substations, grid integration solutions, industrial steam turbines	NA	Participation expected to rise as power intensity and grid complexity increase
CG Power	Power transformers (domestic & exports)	NA	Secured $99mn export order for US data center. Data center identified as high growth vertical
GE Vernova T&D India	Grid integration and substations (220–765kV)	NA	Data centers currently contribute a small share of overall order intake, with U.S. being a larger established market
Atlanta Electricals	Transformers for data center developers	NA	Continuously quoting for DC projects; longer finalization timelines noted. Engaged with large private developers for transformer supply to upcoming DC parks in western and southern India
ABB India	Electrification and automation solutions, LV & MV switchgear	~10% of total order backlog (INR104.7bn)	Views data centers as a long-term structural opportunity aligned with its electrification and automation portfolio, with expectations of continued capacity build-up
Siemens India	Distribution, Automation, Software, Switchgear, GIS, Vacuum interrupters	NA	Data centers, along with T&D and commercial buildings, contribute 40–50% of the SI business. Investing INR3.3bn in the Goa facility to expand vacuum interrupter and GIS manufacturing

Source: Company, PL

Exhibit 21 : Capital Goods companies with offered products and services for data centers and their recent commentary

Company	Products Supplied to Data Centers	Data Center contribution	Comments
Backup Power Generators			
Cummins	High-horsepower backup gensets (≥2,500kVA)	~25% of powergen sales in 9MFY26.	Primarily supplies HHP gensets for data centers. Business described as lumpy.
Kirloskar Oil Engines	Diesel gensets for backup power	Revenue from data centers grew by 235% YoY in Q3FY26 and 132% YoY in 9MFY26.	Primarily supplies HHP gensets for data centers. Technical and specification driven (e.g., Optiprime)
TDPS	Generator solutions	NA	Expanded capacity with a third plant (Dec'25) and prioritized the generator vertical to meet strong data center demand. Expect INR5.5-6.0bn AI-led data center investment related orders per quarter
Captive Power Generation (Turbines)			
Triveni Turbine	Steam turbines for combined-cycle applications	NA	Enquiry size of 20-70MW data centers. Significant increase in data center enquiries from the US. Data center is not expected to exceed ~20% of total order book
Cooling Solutions			
Kirloskar Brothers	Pumps, cooling and firefighting systems	NA	Executed 25-30 data center projects till date. Typically 4-6 data center projects are active on the US shop
Thermax	Industrial cooling and boiler systems	NA	Secured 2 major data center wins in Q3FY26—one in India and one for a marquee US data center client
Praj Industries	Cooling and thermal management solutions	NA	Currently in early stages of developing the data center vertical. Plans to supply cooling solutions for domestic and US data centers
Cables and Conductors			
Apar Industries	Conductors and power cables	NA	Estimated wallet share per data center project is 4-5%. Data center is driving demand in the US

Source: Company, PL

Management commentary across companies indicates that data center demand is gaining traction across transformers, switchgear, and backup power segments, with select players already witnessing meaningful order inflows. While core electrical players are seeing direct benefits, adjacent segments such as cooling and utilities are witnessing early-stage participation. Overall, the opportunity is broad-based, with varying degrees of maturity across segments.

Key components of electrical systems

To minimize power distribution losses, we want to keep voltage as high as possible until being physically close to the end device. But HV can be dangerous and requires more insulation, which isn't suitable near a building; therefore, MV (e.g., 11kV or 25kV or 33kV) is the preferred solution for power delivery into the building. When getting inside the data hall, voltage needs to be stepped down again, to LV (415V three-phase in the US).

Transformers: From utility grid to sever racks

- Transformers act as the backbone of the facility's electrical distribution system, bridging the gap between HV utility power and the LV requirements of sensitive IT equipment.
- Transformers in a data center step down incoming **MV power (10kV–35kV)** from the grid or generators to usable levels such as **480V, 400V, or 208V**. They also isolate and condition power between the UPS and IT loads, ensuring stable and clean electricity reaches servers, racks, networking equipment, and cooling systems.
- **(Utility Grid → MV Switchgear → MV Transformer → UPS → PDU Transformer → Server Rack)**
- In large data centers, step-up transformers raise LV power from generators or renewables, which operate on the site (e.g., 400V), to MV so it can synchronize with the grid and feed backup power into the main distribution system.
- **Tier III data centers use N+1 redundancy**, allowing maintenance without disrupting operations. Tier IV requires **2N architecture**, meaning 2 fully independent power systems for complete fault tolerance and uninterrupted uptime.
- Transformers constitute ~5% of total data center capex, implying **~INR75bn total addressable opportunity** for players in next 5 years, including CG Power, Hitachi Energy India, Siemens Energy, Voltamp Transformers, Atlanta Electricals, Schneider Electric and GE Vernova T&D.

Exhibit 22 : **Typical transformer configuration across power systems applications**

Application	Typical Transformer Type	Voltage Range	Placement	Players
MV Utility Input	Oil-Immersed / Cast Resin	13.8kV → 480V	Outdoor/Indoor Substation	Hitachi Energy India, CG Power, GE Vernova
UPS Isolation	Dry-Type / Cast Resin	480V → 480V (Isolated)	UPS Room / Electrical Room	Voltamp, CG Power and Hitachi Energy, Schneider electric
PDU Level Step-Down	Dry-Type	480V → 208V / 120V	Near Data Hall / Rack Area	Voltamp and Atlanta Electricals, CG Power
On-Site Generation Step-Up	Oil-Immersed / Dry-Type	400V → 13.8kV	Generator Yard / MV Switchgear	Siemens Energy, GE Vernova and CG Power
Edge or Modular DC Power	Cast Resin / Dry-Type	400V / 208V Distribution	Enclosure / Containerized Unit	Voltamp Atlanta Electricals and Schneider Electric

Source: Industry, PL

After stepping down from HV (i.e., 115kV or 230kV etc.) down to MV (i.e., 33kV, 22kV or 11kV etc.) with the help of a HV transformer, an MV switchgear is used to distribute this MV power near individual pods. Typical IT equipment like servers and networking switches can't run on 11kV, so before getting power inside a data hall, another set of MV transformers are required, generally 2.5MVA or 3MVA, to step down from MV (11kV/25kV/33kV) to LV (415V, common in the US).

Switchgear: Safeguarding uptime in high-density data centers

- Data center switchgear refers to the critical infrastructure component within a data center that facilitates the efficient and reliable distribution of electrical power to various equipment and systems. It typically consists of electrical switchboards, circuit breakers and other protective devices, all designed to regulate and control the flow of electricity.
- Data center switchgear plays a vital role in ensuring **uninterrupted power supply, load balancing, fault protection, and overall operational stability** of the data center environment. By managing the power distribution, switchgear helps maintain uptime.
- Data center switchgear accounts for ~6% of total data center capex, creating **~INR90bn opportunity** over the next 5 years. This creates an addressable opportunity for Hitachi Energy, GE Vernova T&D, ABB India, Schnieder Electric.

Exhibit 23 : **Switchgears – Types and applications**

Types of Switchgear	Voltage of electric power	Key Components/ Compartments	Variants	Role	Players
MV Switchgears	up to 75kV	Circuit breakers, busbars, protection relays, insulation systems	GIS, Metal-clad, metal-enclosed, pad-mounted, vault, arc-resistant switchgear	Grid power distribution	Hitachi energy, GE Vernova, ABB India, Siemens Energy
LV Switchgears	up to 1kV	Breaker compartments, bus compartments, cable compartments	Air circuit breakers, Molded case circuit breakers	Power distribution to UPS	Schneider Electric & LT Switch Gear, ABB India

Source: Industry, PL

Scaling with power gensets anchor data center expansion

Power infrastructure becoming strategic amid rising data center complexity

- With accelerating demand for digital services and data storage, power infrastructure is emerging as a critical differentiator in data center design, requiring not just reliability and resilience but also flexibility to meet sustainability targets and evolving regulatory requirements.

- Diesel generators continue to dominate as the primary backup power solution, given their proven reliability and ability to restore power within 10–15s during outages. These systems are widely deployed across hyperscale, enterprise, and colocation data centers, ensuring minimal downtime.

Shift toward cleaner backup solutions, albeit at a nascent stage

- While diesel remains the backbone, natural gas-based generators are gaining traction as a relatively lower emission alternative, particularly in large-scale deployments where sustainability is a key consideration.

- Hydrogen-based generators represent a next-generation, near-zero emission solution, though adoption remains early-stage, with hyperscalers such as Microsoft and Amazon actively exploring deployment.

Significant capex opportunity driven by scale and redundancy requirements

- Backup power requirements scale with data center capacity and **redundancy architecture (N, N+1, 2N).** For instance, a **100MW facility may require ~40 gensets**, with higher configurations necessitating incremental capacity.

- Gensets account for ~9% of total data center capex, implying a sizable opportunity. At an estimated INR650mn/MW cost and ~2,200MW capacity addition expected by FY30, this translates into a **~INR134bn** market opportunity over the next 5 years.

Supplier ecosystem aligned with hyperscale demand

- High horsepower gensets (~2,500kVA and above) are typically deployed in hyperscale and colocation data centers, while enterprise and edge facilities utilize relatively lower capacity systems.

- The market is led by global and domestic players such as **Cummins, Caterpillar, MTU, and KOEL,** which are well-positioned to benefit from the ongoing data center capex cycle.

Exhibit 24 : **Types of gensets required in different types of data center**

Types of Gensets	Where used	Capacity
Diesel Generators	Hyperscale, Enterprise and Colocation	2-4.5MW
Natural gas generators	Large scale Data centers	1-4MW
Hydrogen Generators	Hyperscale (pilot stage)	Early Adoption

Source: Industry, PL

Exhibit 25 : Generator capacity requirement by data center

Data Center	Size	Per hour power consume	Average Capacity per MW	Redundancy	Players
Edge	1-5MW	0.5-1MW	<1MW	Singel Genset	Cummins, Caterpillar, KOEL, MTU
Enterprise	0.5-10MW	1-10MW	N or N+1	Single Gensets or N+1	
Colocation	5-100MW	10-100MW	1-2.5MW	N+1 or 2N	
Hyperscale	50-1,000MW	~100MW	2.5-4MW	2N	

Source: Industry, PL

Bridging power gaps UPS systems enable zero downtime operations

UPS plays a critical role in protecting **IT equipment from power disturbances**. From brief voltage dips to full power outages, even a short interruption can cause data loss, hardware damage, or service downtime.

The level of protection a UPS provides depends largely on its internal design. In general, UPS systems are classified into 3 main types: offline (standby), line-interactive, and online (double-conversion).

Exhibit 26 : UPS systems used in data centers

Type	Working	Usage
Standby (Offline) UPS	Supplies power only when outage occurs	Used in small IT loads
Line interactive UPS	Regulate voltage fluctuations	Used in edge and small enterprise data centers
Double Conversion UPS	Continuous AC-DC-AC conversion	Most common in large data centers

Source: Industry, PL

- UPS provides instant backup power to data center equipment when grid power fails, ensuring continuous operation until generators start. UPS systems are a critical layer of power reliability in Tier III and IV data centers. It acts as the bridge between power failure and generator setup (10-15s).
- UPS systems are typically deployed in N+1 or 2N redundancy configurations in Tier III and IV data centers to ensure high availability and fault tolerance.
- Online double-conversion UPS is the most widely used technology in large data centers as it provides continuous AC-DC-AC power conversion and protects equipment from voltage fluctuations, surges, and harmonics.

UPS batteries critical for instant power continuity in data centers

UPS batteries play a mission-critical role in data centers by providing **instantaneous backup power** during grid failures, ensuring there is zero interruption to IT equipment. Unlike generators, which typically take 10–15s to start, UPS batteries bridge this gap, maintaining continuous power supply and preventing data loss, hardware damage, or service disruption.

In high-availability environments such as Tier III and IV data centers, UPS battery systems are deployed in redundant configurations **(N+1 or 2N)** to ensure fault tolerance and uninterrupted operations. The growing adoption of AI workloads and high-density computing is further increasing reliance on advanced battery technologies, given their ability to support short-duration, high-power requirements with high reliability.

From a technology standpoint, the UPS battery market is evolving rapidly. valve regulated lead acid (VRLA) batteries have historically been the dominant technology, forming the backbone of data center backup systems. However, increasing focus on sustainability, safety, longer lifecycle, and lower maintenance is driving a shift toward **lithium-ion batteries**, which are gaining strong traction across hyperscale deployments. In addition, emerging technologies such as nickel-zinc and sodium-ion batteries are beginning to enter the market, while flywheel systems offer an alternative for short-duration backup.

Exhibit 27 : Evolution of UPS battery technologies in data center

Types	Characteristics	Adoption
Lithium-ion	Higher upfront cost but have longer lifespan and low maintenance	Rapidly growing in hyperscale
Flywheel	Higher efficiency, smaller footprint	Niche but growing in hyperscale
VRLA	Lower upfront cost and have shorter life	Large installed base but decline in new deployments

Source: Industry, PL

The market is undergoing a clear transition from VRLA to lithium-ion, driven by total cost of ownership benefits, higher energy density, and suitability for high-density AI workloads.

UPS (systems + batteries) cost is ~15% of the total data center cost. For the next 5 years, the addressable opportunity will be **~INR224bn**, likely to be beneficial for players such as **Vertiv India, Schneider Electric, Eaton, ABB, Delta Electronics, and Huawei Technologies**

PDUs and PSUs driving last-mile power intelligence in data centers

PDUs and PSUs form the last-mile layer of data center power architecture, directly influencing power quality, energy efficiency, and uptime at the server level. PDUs distribute power from UPS systems to IT racks, with increasing adoption of intelligent PDUs enabling real-time monitoring, load balancing, and integration with DCIM systems. This is becoming particularly critical as rack densities rise (20–40kW), driven by AI and HPC workloads.

Exhibit 28 : PDUs requirement across data center types

Data Center Type	Size	No. of PDUs required	Types of PDUs	Players
Edge	<1-5MW	<500	Basic PDU/ Metered PDU	Schneider Electric, Vertiv, Eaton, Legrand India, ABB, Rittal
Enterprise	0.5-10MW	50-1,000	Metered PDU/Monitored PDU	
Colocation	5-100MW	500-10,000	Monitored PDU/ Switched PDU	
Hyperscale	100MW	10,000	Switched PDU/ATS PDU/High Density PDU	

Source: Industry, PL

PSUs, embedded within **servers, convert AC power into stable DC output** and are a key determinant of energy efficiency and equipment reliability. The shift toward high-efficiency PSUs (80 PLUS Platinum/Titanium) and redundant configurations (1+1 or higher) will ensure uninterrupted operations in Tier III and IV environments. With AI-led workloads requiring higher wattage per server, PSU specifications are evolving to handle greater load variability and power intensity.

Exhibit 29 : PSU configuration across data center types

Type of PSU	Characteristics	Use Case
Standard PSU	Basic AC-DC conversion, lower efficiency	Small enterprise / legacy setups
High-Efficiency PSU (80 PLUS Gold/Platinum/Titanium)	High efficiency, lower losses	Enterprise, colocation
Redundant PSU (1+1 / 2+1)	Backup PSU in case of failure	Tier III & IV data centers
High-Wattage PSU (2–3kW)	Supports GPU/AI workloads	Hyperscale / AI data centers

Source: Industry, PL

PDUs and PSUs account for ~7% of total data center capex, translating into **~INR104bn** market opportunity over the next 5 years, benefiting both domestic and global suppliers.

Cables – Backbone of power and data flow in data centers

Cables form a critical enabling layer in data center infrastructure, supporting both power transmission (LV/MV) and high-speed data connectivity (fiber optics). While relatively smaller in value (~9% of total data center capex), cable demand scales directly with data center capacity additions (MW) and traffic growth.

Exhibit 30 : Classification of Power and Data cables across data center

Segment	Type	Application	Key Characteristics	Key players
Power Cables	LV (≤1.1kV)	UPS → PDU → Rack	Copper, XLPE, LSZH	Apar Industries, KEI, RR Kabel, Finolex
	MV (11–33kV)	Grid → Transformer	Armored, high load	
Data Cables	Fiber Optic	Backbone connectivity	High speed, low latency	HFCL, Sterlite Tech
	Copper (Cat6/Cat6A)	Rack-level	Short distance	

Source: Industry, PL

Power cables used in data centers

Power cables are critical for **distributing electricity to and across a data center**. Data centers rely on different types of power cables depending on voltage requirements and environmental conditions.

Exhibit 31 : Power cables used in data centers

Cable Type	Voltage Rating	Max Temperature	Data Center Application Impact
Tray Cables (TC, TC-ER, ITC, PLTC)	600V–2000V	90°C (dry/wet)	Distributes power across data center racks via cable tray systems, reducing clutter and improving airflow
EPR/PVC Cables	600V–35kV	90°C (wet/dry)	Used for power feeds in areas exposed to moisture, chemicals, or HVAC systems in data centers
SOOW Cables	600V	90°C (dry), 60°C (wet)	Provides portable or emergency power for backup generators and maintenance equipment
THHN/THWN Cables	600V	90°C (dry), 75°C (wet)	Standard wiring for electrical panels, branch circuits, and rack power distribution
MC (Metal-Clad) Cables	600V	90°C (dry/wet)	Fire-resistant armored cable used for secure power distribution to critical server loads
XHHW-2 Cables	600V–2000V	90°C (wet/dry)	HV wiring for main power feeds, backup power units, and redundant systems
DC Power Cables	600V–2000V	90°C (dry/wet)	Supplies power to battery backup (UPS) and direct DC-powered server racks
EPR/XLPE Cables	600V–35kV	90°C (dry/wet)	HV cables for transformers, generators, and main electrical infrastructure
EPR/XLPE Cables	2000V	90°C (dry/wet)	Flexible heavy-duty power cable for mobile or temporary data center operations

Source: Industry, PL

Exhibit 32 : Data cables used in data center

Cable Type	Max Speed	Max Distance	Best Use Case	Used In
Cat6a	10Gbps	100m	Ethernet, LAN	Traditional and enterprise data centers
Cat7a	40Gbps	100m	Data centers	Enterprise data centers
Twinaxial (DAC)	100Gbps	≤7m	Short-distance high-speed connections	AWS, Google Cloud, Microsoft Azure
Single-Mode Fiber	400Gbps	40km	Backbone network	AWS, Google Cloud, Microsoft Azure, Meta AI, NVIDIA AI
Multimode Fiber	100Gbps	≤500m	Short fiber runs	AWS, Google Cloud, enterprise data centers
Active Optical Cable (AOC)	400Gbps+	≤30m	High-speed switch-to-server connections	AI data centers (NVIDIA DGX, Meta AI), AWS, Google Cloud, Microsoft Azure
InfiniBand Cable	200Gbps+	≤10m (DAC) / ≤100m (AOC)	HPC, AI workloads, cloud computing	NVIDIA AI clusters, Meta AI, AWS HPC, financial trading data centers
Breakout Cables (Fanout)	Varies	Varies	Splitting 100G into multiple 25G or 40G links	Hyperscale cloud data centers (AWS, Azure, Google Cloud), AI clusters
Parallel Optics (MPO/MTP)	400Gbps+	150m	High-speed optical interconnects, hyperscale cloud	AWS, Microsoft Azure, Google Cloud, Meta AI
Direct Attach Copper (DAC)	100Gbps+	≤7m	Low-cost server-to-switch links	AWS, Google Cloud, Microsoft Azure, financial trading
Active Copper Cables (ACC)	100Gbps+	≤15m	Extended copper interconnects for reduced latency	Cloud and AI-driven data centers (Meta AI, AWS, Azure)
Coaxial Timing Cables	10Gbps	≤100m	Datacenter timing synchronization	Financial trading data centers, satellite edge computing

Source: Industry, PL

Cooling system: Value chain dynamics and technology transition

Cooling systems are a critical component of data center infrastructure, directly impacting performance reliability and operating economics. Storing and processing very large volumes of data leads the servers in data centers to generate significant heat. These high temperatures cause server overheating, hardware failure and unplanned downtime. All these problems can have significant financial implications for hyperscale and enterprise data center customers.

In today's datacenters, cooling systems represent the **second-largest capital expense (~18-20%)** after electrical systems (excluding IT equipment). They've become perhaps the most critical design consideration due to their architectural variety and significant impact on operating expenses, particularly energy - the largest variable cost for a Cloud Service Provider (CSP). Electricity consumption related to non-IT equipment, of which the majority is cooling, is purely a non-productive expense which should be minimized – but there are tradeoffs.

Evolution of data centers cooling technologies

- Air cooling systems: These systems play a critical role in enhancing cooling efficiency within data center environments by optimizing the distribution of air across server racks. These systems are designed to prevent the mixing of hot and cold air streams, thereby improving cooling effectiveness and reducing overall energy consumption. Key components include **hot and cold aisle containment solutions, raised floor systems, and airflow management panels,** all of which work together to maintain consistent temperature profiles and improve operational efficiency at the rack level.

- Liquid cooling systems: These systems are an increasingly important segment within data center infrastructure, driven by the rise of high-density computing workloads, particularly in AI/ML applications and GPU-based deployments. These systems offer significantly higher heat transfer efficiency compared to traditional air-based cooling, making them well-suited for managing elevated rack densities. Key solutions within this segment include **direct-to-chip cooling, rear-door heat exchangers, and coolant distribution units**, each designed to enable more effective and targeted thermal management in next-generation data center environments.

- Immersion cooling systems: An emerging technology where servers are submerged in dielectric fluid, enabling direct and highly efficient heat removal. Includes single-phase and two-phase systems, suitable for ultra-high-density workloads (AI/HPC). Adoption remains nascent but offers strong long-term potential.

Exhibit 33 : Core cooling Infrastructure components are common across cooling ecosystems

Component	Function	Key Insight
Chillers	Produce chilled water that is circulated through the system for heat absorption	One of the largest energy consumers in cooling infrastructure; efficiency improvements (centrifugal / magnetic bearing chillers) directly impact PUE and opex
Cooling Towers / Dry Coolers	Reject heat from the cooling system to the external environment	Typically installed outdoors/rooftops; performance depends on ambient conditions, driving adoption of hybrid & adiabatic systems
CRAC / CRAH Units	Circulate and distribute cooled air within server halls	Critical for rack-level temperature control; shift toward in-row and rear-door cooling for high-density racks
HVAC Systems	Control temperature, humidity, and air quality across the facility	Ensures stable operating conditions; integrated with BMS for energy optimization and redundancy management
Heat Exchangers	Transfer heat between fluids without direct mixing	Enables efficient heat transfer in both air & liquid systems; key enabler in liquid cooling adoption
Pumps & Piping Systems	Circulate chilled water or coolant across the infrastructure	Reliability-critical backbone; energy-efficient pumps can reduce auxiliary power consumption
Air Handling Units (AHU)	Condition and deliver air through filtration, cooling, and airflow control	Used in larger facilities; supports uniform airflow distribution and humidity control
Control & Monitoring Systems (BMS/DCIM)	Monitor temperature, humidity, airflow, and system performance	Enables real-time optimization, predictive maintenance, and improved energy efficiency (lower PUE)
Containment Systems (Hot/Cold Aisle)	Physically separate hot and cold air streams to improve cooling efficiency	Low-cost, high-impact solution to enhance cooling efficiency and reduce energy losses
Liquid Cooling Infrastructure	Directly remove heat using liquid (water or dielectric fluids) at source	Structural shift driven by AI/HPC workloads; supports higher rack densities with lower energy footprint

Source: Industry, PL

Cooling capex, market structure, and technology adoption in India

Of the total data center capex, 10–12% is allocated to non-IT equipment, which includes key cooling components such as **chillers, CRAC/CRAH units, and cooling towers**. In addition, 5–10% of capex is attributed to engineering and construction, which encompasses the build-out of cooling infrastructure, including **chilled water piping, system installation, and associated mechanical works.**

Together, these components form part of the broader mechanical, electrical and plumbing (MEP) ecosystem, within which cooling infrastructure represents a key sub-segment. This highlights the integral role of cooling within overall data center design and execution, spanning both equipment supply and project-led implementation, and underscores its close linkage with the broader power and infrastructure build-out.

Within this ecosystem, the positioning of Indian players is largely concentrated in conventional air- and water-based cooling architectures, which continue to dominate data center deployments across India. This reflects the underlying demand environment, where India accounts for a very small share (~4%) of global data center capacity and there is a constraint in the scale of larger AI-led workloads due to very limited availability of GPUs. At present, computing requirements are largely driven by CPU-based workloads, which are adequately supported by conventional cooling systems, particularly at moderate rack densities.

Existing offerings are predominantly exposed to water-based cooling systems (chilled water loops, cooling towers, heat exchangers), and air-based or hybrid systems (CRAC/CRAH units, dry coolers).

While AI-driven demand is expected to scale over the next 3–5 years, potentially requiring a significant ramp-up in GPU deployment (estimated at ~200,000 units). The transition toward AI-specific data centers is likely to be gradual. As a result, advanced cooling technologies such as **liquid cooling, direct-to-chip, and immersion cooling** are expected to remain a relatively small portion of the market in the near term.

Value chain structure and key players

The data center cooling ecosystem consists of a range of components, spanning from core cooling generation equipment and heat rejection systems to heat transfer components and supporting mechanical infrastructure. In the domestic market, players are positioned across different layers of this value chain, with the most exposure concentrated in conventional air and water-based cooling technologies.

The value chain spans segments with varying levels of technology intensity, value addition, and margin profiles. The high-value, technology-led equipment, which includes **chillers and HVAC systems**, is characterized by relatively higher margins and stronger pricing power, and is supplied by players such as Blue Star, Kirloskar Pneumatic Company, and Voltas, with Thermax also having selective exposure through products such as absorption-based systems and heat pumps.

The mid-value segment, comprising equipment such as cooling towers, evaporative condensers, dry coolers, and shell-and-tube heat exchangers, is addressed by players including **Thermax and Praj Industries**. These components are critical to overall system efficiency and operating costs, particularly in large-scale facilities, although they typically command relatively moderate margins.

At the lower end of the value chain are execution-led mechanical infrastructure components, including piping skids, pressure vessels, structural frames, and other custom fabricated equipment, which form part of the MEP scope of data center projects. This segment is largely served by companies such as Praj Industries, with players like Blue Star also having meaningful exposure through their MEP/HVAC project execution businesses. This segment is characterized by relatively lower margins and higher dependence on project execution.

Exhibit 34 : Key Indian players in Data Center Cooling – Product portfolio & positioning

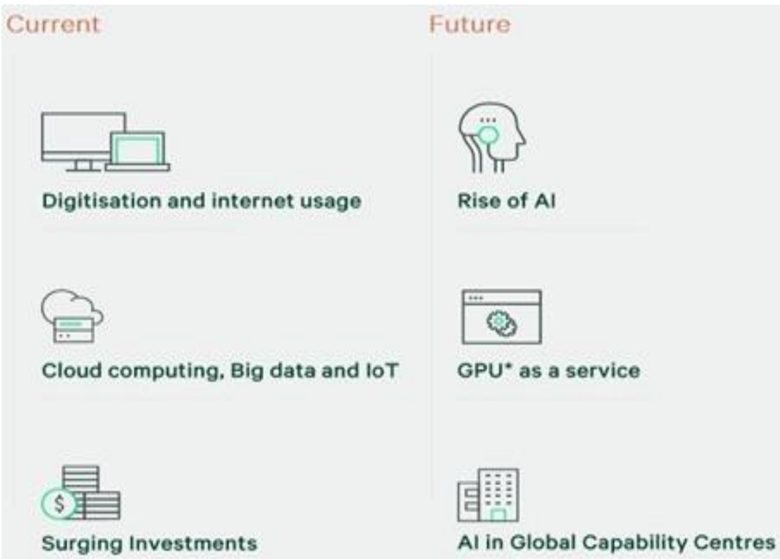
Company	Product Category	Product	Key Specifications / Positioning
Blue Star	Core Cooling Equipment	Data Center Chillers	Capacity up to ~550 TR; used in primary cooling systems
	Core Cooling Equipment	Centrifugal Chillers	Capacity up to ~1000 TR; suited for large-scale data centers
	Air-based Systems	Packaged Ducted / HVAC Split AC	Used in auxiliary / support areas
Thermax	Core / Alternate Cooling	Vapor Absorption Machines	Waste heat-driven; lower operating costs
	Core / Alternate Cooling	Heat Pumps	0.2MW – 40MW; ~40% lower opex; ~90% lower emissions
	Mid-value Equipment	Evaporative Condensers	Energy efficient; long lifecycle; low maintenance
	Mid-value Equipment	Closed Loop Cooling Towers	Suitable for low approach temperatures; improves efficiency
	Mid-value Equipment	Dry Coolers	Zero water usage; minimal maintenance
Praj Industries	Mid-value Equipment	Shell-and-Tube Heat Exchangers	Heat transfer across chilled & condenser water loops
	MEP / Fabrication	Piping Skids / Modular Skids	Pre-engineered systems for fluid circulation
	MEP / Fabrication	Pressure / Buffer Vessels	Flow and pressure stabilization in cooling systems
	MEP / Fabrication	Structural Frames / Platforms	Equipment support infrastructure
	MEP / Fabrication	Custom Fabricated Equipment	Client-specific engineered cooling modules
Kirloskar Pneumatic	Core Cooling Equipment	Data Center Chillers	Precise temperature control; low lifecycle cost
	Core Cooling Equipment	Centrifugal Chillers	Used in hyperscale central cooling plants
	Core Cooling Equipment	Screw / Scroll Chillers	Used in modular and mid-scale facilities
	Core / Alternate Cooling	Vapor Absorption Chillers	Heat-driven cooling; energy efficient
	Core Cooling Systems	Industrial Refrigeration Systems	Custom large-scale cooling infrastructure
Voltas	Core Cooling Equipment	Centrifugal Chillers	Expanding presence in high-capacity segment
	Core Cooling Equipment	Air & Water-Cooled Chillers	Focus on oil-free, energy-efficient systems
	Air-based Systems	VRF Systems	Advanced HVAC solutions via partnerships
	MEP / EPC	Integrated HVAC Solutions	End-to-end execution leveraging domestic manufacturing

Source: Company, PL

What is propelling the expansion of India's Data center market?

The foundational growth drivers for India's DC market, such as rapid digitalization, internet penetration, cloud computing, big data, and IoT, bolstered by supportive government policies and investments, will continue to remain strong. However, going forward, the global push toward AI and the continued scaling of cloud operations by major companies will be the key catalysts propelling India's DC expansion.

Exhibit 35 : Growth drivers for data center

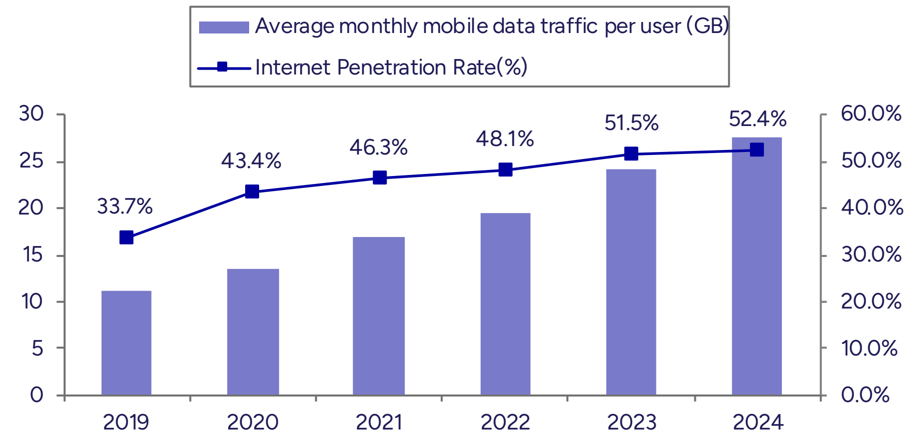


Source: Industry, PL

Digitalization and internet usage

- India's digital acceleration is driven by rising smartphone penetration, affordable data, and expanding 5G/Bharat Net infrastructure, with the Digital India initiative catalyzing robust DPI and wider access. The digital economy employs **~14.7mn people (2.6% of workforce)**, is ~5x more productive, and is expected to double in size, contributing ~20% to national income, by FY30 driving strong data demand and DC growth.

Exhibit 36 : **Data traffic and share of internet users in India**



Source: Industry, PL

Cloud computing, Big Data and IoT

The 2022 Data Protection Bill, mandating data localization, has accelerated adoption of cloud, big data, and IoT. This has emerged as a key investment driver, with over 50% of firms in financial services and e-commerce expected to realign their data storage strategies by 2024, thereby underpinning strong data center build-out in India.

Investments

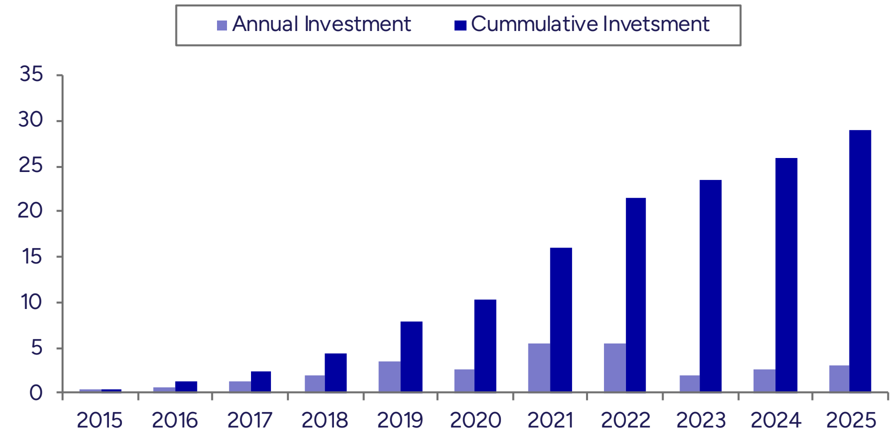
Strong growth visibility has attracted significant capital inflows into India's DC market from global investors, real estate developers, and private equity funds. Between 2019 and 9M2025, cumulative investment commitments reached ~$94bn, with Telangana, Maharashtra, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, and West Bengal emerging as key hubs.

Future growth driver

Rise of AI

India's AI market is projected to more than **triple to ~$17bn by 2027**, positioning it among the fastest-growing globally. Growth is driven by rising enterprise tech investments, a strong digital ecosystem, and a deep talent pool. India has over 600,000 AI professionals, expected to scale to ~1.25mn by 2027, accounting for ~16% of global AI talent second only to the US.

Exhibit 37 : Private investment in AI in India



Source: Industry, PL

GenAI poised to unleash DC demand's next wave

AI capabilities have evolved from routine data analysis to content creation through GenAI, led by advancements such as OpenAI's GPT-5 LLM. With strong expectations around productivity gains, technology diffusion, and addressing labor shortages, adoption in India has accelerated across both enterprise and consumer segments. Consequently, GenAI is poised to be a key growth lever, with potential to contribute $1.2–1.5trn to GDP by 2029–30.

AI in GCCs

Over the past decade, India's global capability centers (GCCs) have evolved from offshore support units to innovation hubs. As of FY24, India hosts 1,700+ GCCs employing ~1.9mn professionals, generating **$64.6bn** in revenue, with the market projected to reach $110bn by 2030.

With advancements in technology and rising adoption of automation and AI, GCCs are enhancing operational efficiency and assuming a more strategic role within global enterprises. AI, in particular, is driving automation, talent transformation, and cost optimization, enabling GCCs to improve service delivery and accelerate innovation.

Exhibit 38 : Policy support in India

Source: Industry, PL

Global data centers: AI-led surge to reshape global data center theme

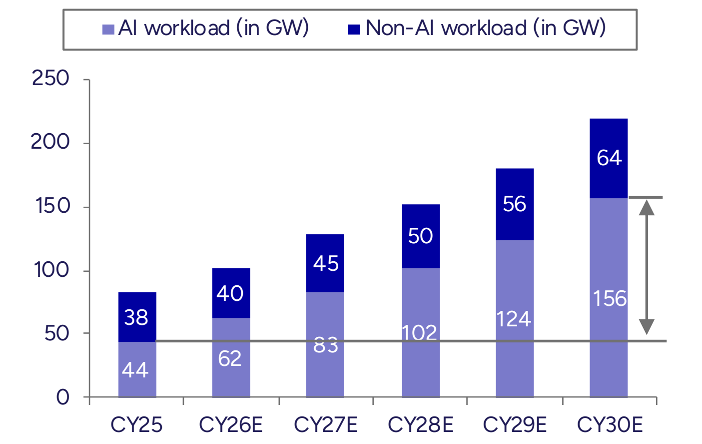
The acceleration of digital transformation is positioning data centers as a critical backbone of the digital economy, enabling applications ranging from AI workloads and real-time analytics to autonomous systems. According to McKinsey & Company, global capital expenditure on data center infrastructure (excluding IT hardware) is expected to **surpass $1.7 trillion by 2030**, driven by rapid AI adoption, the proliferation of edge computing, and advancements in high-performance computing (HPC). This surge in demand is reshaping adjacent sectors such as energy, real estate, and construction.

To cater to the rising demand for compute and power capacity, data center campuses are evolving from **tens of megawatts (MW) to hundreds of megawatts**, with some developments scaling toward **gigawatt (GW) levels**. At the same time, emerging innovations such as distributed and distilled AI training models are influencing data center design and deployment strategies, further intensifying the complexity of large-scale expansions. As a result, stakeholders across the value chain are increasingly required to rethink traditional design and construction approaches, leveraging new technologies and cross-industry learnings to unlock economies of scale.

On the demand side, global data center growth continues to be fueled by accelerating **cloud adoption, exponential growth in data generation, and the rapid scaling of AI and HPC workloads**. Hyperscale operators are expected to significantly expand capacity over the next decade to meet these requirements. Notably, the volume of data generated over the next five years is projected to exceed that created in all preceding years combined.

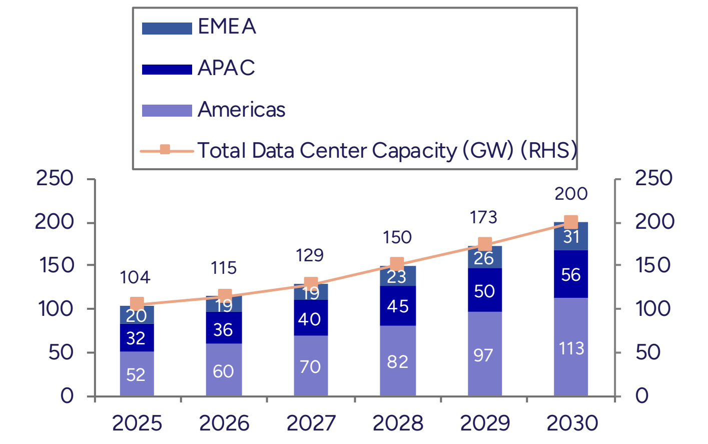
This sharp rise in demand is expected to create substantial opportunities across the data center ecosystem, including developers, operators, and ancillary solution providers. The global data center market is projected to expand by **~100GW between 2025 and 2030**, effectively doubling in size. By 2030, total installed capacity could reach **~200GW**, supported by continued hyperscale investments and AI-led demand growth (source: JLL).

Exhibit 39 : 3.5x demand increase in AI workload data center



Source: Industry, PL

Exhibit 40 : Global data center capacity to double by 2030



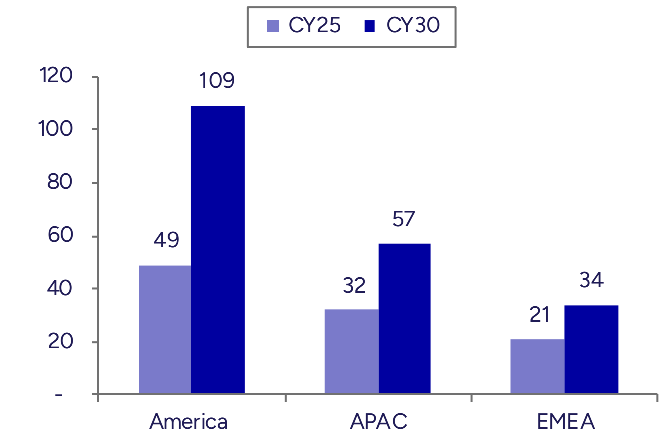
Source: Industry, PL

US maintains global data center leadership, accounting for more than 50% share

Global data center capacity is set to witness a **sharp expansion**, with the industry projected to add **~97GW** between 2025 and 2030, effectively doubling to **~200GW**. Growth will be driven by hyperscale cloud expansion and increasing AI-led demand, which is significantly raising compute intensity and power requirements. The Americas remain the dominant region, accounting for **~50% of global capacity**, and is expected to grow at the fastest pace (~17% CAGR), led by the US, which contributes to **~90% of the regional capacity**.

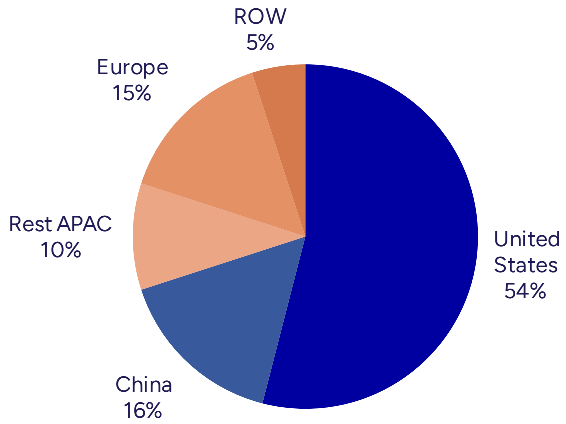
Across other regions, APAC capacity is expected to grow from **32GW to 57GW by 2030 (~12% CAGR),** with **colocation emerging as the key growth driver (~19% CAGR)**, while on-premise capacity continues to decline (~6%) amid ongoing enterprise cloud migration. **EMEA is projected to grow at ~10% CAGR**, supported by government-led AI infrastructure investments and increasing demand for sovereign cloud solutions driven by data privacy regulations, with capacity additions concentrated in key European markets and emerging Middle Eastern hubs.

Exhibit 41 : American DC market to double by CY30



Source: Industry, PL

Exhibit 42 : US continues to hold >50% of total data center capacity



Source: Industry, PL

Data centers operate across multiple configurations, shaped by factors such as ownership structures, workload requirements, business needs, and the desired levels of performance, flexibility, and security. Broadly, based on operational diversity, data centers can be classified into 4 key categories, based on who operates them and the nature of workloads supported. In addition, data centers are also categorized based on technical specifications, typically defined under Tier I–IV standards, which indicate varying levels of availability, redundancy, compartmentalization, and resilience of infrastructure. These classifications serve as a benchmark for assessing reliability and performance across data center assets.

Exhibit 43 : Edge and hyperscale data centers to dominate the global market share

Type of data center	Edge	Enterprise	Colocation	Hyperscale
Size	1-5MW	0.5-10MW	5-100MW	50-1000MW
Per hour power consumption	<5MW	1-10MW	10-100MW	~100MW
Location	Preferably on-site	On-site and off-site	Off-site	Off-site both
Ownership and operation	Owned and operated by single organization or by third party	Owned and operated by single organization	Owned and operated by third party	Owned and operated by single organization
Key sectors and applications	5G, IoT, and public service digitalization	Banks, enterprise or business digitalization and cloud adoption	E-commerce, OTT	GenAI training, deep learning, large-scale data processing and analytics
Cloud service				
Growth driver	Latency, distributed AI, 5G/IoT	Compliance, latency, legacy systems	Repatriation, interconnection, cost	AI/GenAI, SaaS, cloud migration

Source: Industry, PL

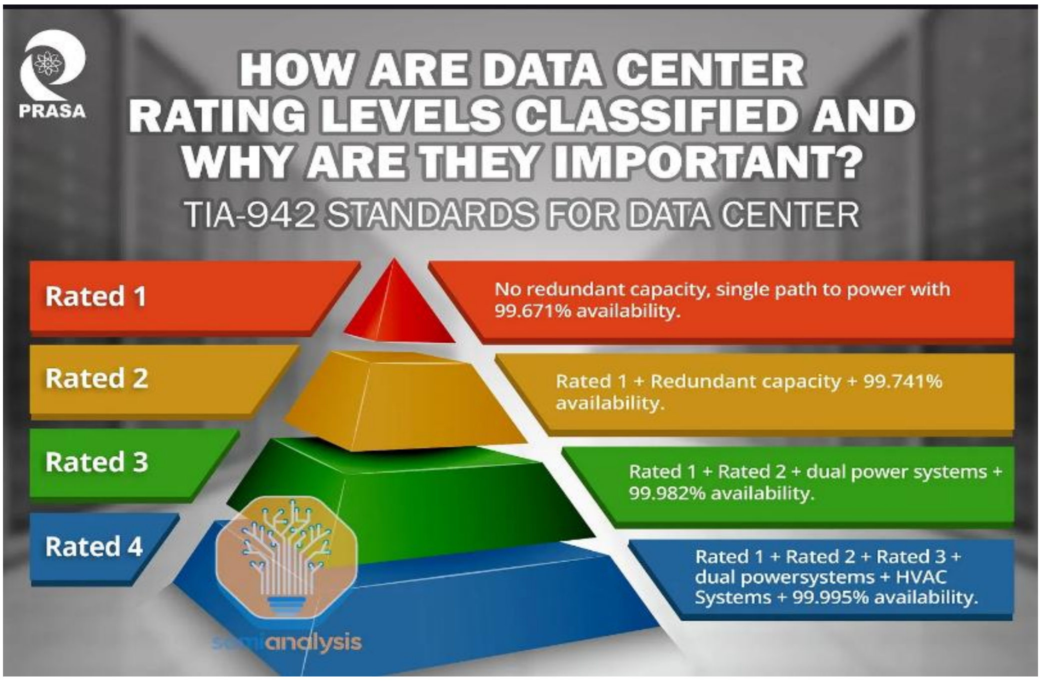
Exhibit 44 : Data center classification

Tier	Infrastructure Level	Redundancy	Maintenance Capability	Downtime Risk	Typical Use Case
Tier I	Basic infrastructure with UPS, cooling, and backup generator	Minimal (limited redundancy in components)	Requires full shutdown for maintenance	High (vulnerable to failures)	Small businesses, non-critical workloads
Tier II	Adds redundant power & cooling components (UPS, chillers, pumps, generators)	Partial redundancy (components only, single distribution path)	Limited maintenance flexibility (some components removable)	Moderate (unplanned outages still impact operations)	SMEs, low-to-moderate critical workloads
Tier III	Concurrently maintainable infrastructure with dual distribution paths	High redundancy (components + distribution paths)	No shutdown required for maintenance	Low (high availability)	Enterprises, colocation, mission-critical workloads
Tier IV	Fully fault-tolerant infrastructure with isolated systems	Very high (independent and redundant systems)	No downtime even during failures	Very low (maximum uptime)	Hyperscalers, AI workloads, ultra-critical applications

Source: Industry, PL

Higher tier data centers (Tier III & IV) are increasingly preferred, driven by hyperscale and AI workloads that demand near-zero downtime, high redundancy, and uninterrupted operations.

Exhibit 45 : Tier-wise classification of data centers



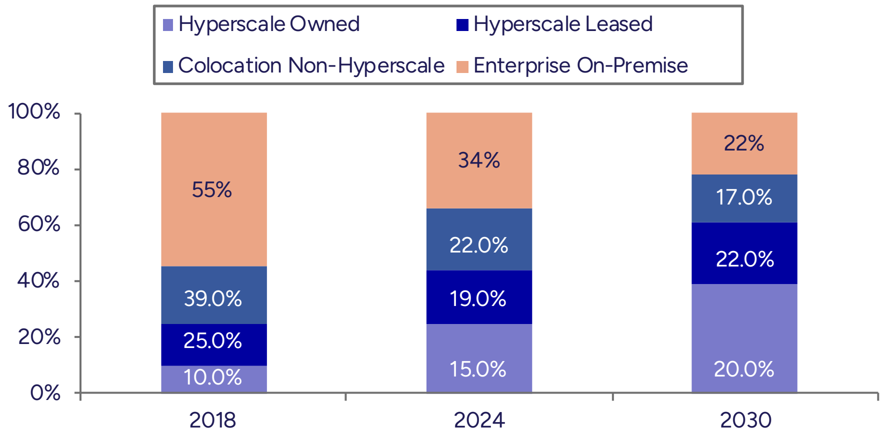
Source: Industry, PL

Global data center capacity is shifting rapidly to hyperscale operators

- Globally, hyperscale operators run 1,189 large data centers, accounting for ~44% of global capacity, with over half of this capacity in owned facilities and the remainder leased.
- Non-hyperscale colocation contributes ~22%, while on-premises capacity has declined to ~34%, a sharp fall from ~56% 6 years ago, indicating a structural migration away from captive infrastructure.
- Looking ahead to 2030, hyperscalers are expected to command ~61% of total capacity, driven by ~3x growth in hyperscale capacity, while on-premises share is likely to decline further to ~22%.
- Although colocation share may moderate, absolute capacity is expected to grow in near double digits, supported by enterprise outsourcing trends.

- On-premises capacity, after a prolonged period of stagnation, is witnessing a modest revival led by GenAI and GPU-driven workloads; however, its share is expected to continue declining (~200bps annually) over the forecast period.

Exhibit 46 : Hyperscale operators to account for ~60% of global capacity by 2030



Source: Industry, PL

Factors cause data center cost to vary

- **Geographic location** affects land, labor, and electricity costs, as well as cooling requirements. Urban locations offer better network connectivity but higher real estate expenses.
- **Facility tier level** directly impacts expenses. Tier III and IV data centers require more redundant components, increasing both capital investment and operational costs. Tier IV facilities provide 99.995% uptime, but cost significantly more than Tier II data centers, which offer 99.741% availability.
- **Power density** influences cooling requirements. High-density computing environments with racks drawing 10kW or more per square foot of floor space require advanced cooling solutions that increase operational complexity.
- **Climate conditions** determine cooling efficiency. Data centers in cooler climates can leverage free-cooling technologies, substantially reduce HVAC costs and improving energy efficiency.

800 VDC architecture emerging as a structural shift in data center power design

The rapid rise in AI-driven workloads is pushing data center power density to unprecedented levels, with rack-level demand moving toward megawatt scale. This is exposing the limitations of traditional **AC-based power architecture**, which involves multiple conversion stages, higher energy losses, and increasing infrastructure complexity. In this context, **800 VDC (LV direct current) architecture** is emerging as a next-generation solution, enabling **direct, efficient power delivery with fewer conversion layers**, lower losses, and improved scalability.

The transition to 800 VDC is particularly relevant for **AI-optimized data centers**, as it reduces cabling requirements, lowers cooling demand, and improves overall energy efficiency, while enabling higher compute density. Global players such as **ABB, Hitachi Energy, and GE Vernova**, in collaboration with ecosystem partners like NVIDIA, are actively developing solutions across the value chain—from power components and system integration to reference architectures—to accelerate adoption of this new paradigm.

The 800 VDC ecosystem is evolving with clearly differentiated roles across key players:

- **ABB** is focused on developing **core DC infrastructure components**, including power converters, switchgear, solid-state breakers, and distribution systems, positioning itself as a key enabler of electrification infrastructure.
- **Hitachi Energy** is building **end-to-end grid-to-rack solutions**, integrating power electronics, control systems, and digital simulation capabilities, thereby acting as a full system integrator.
- **GE Vernova** is driving **reference architectures and grid integration frameworks**, enabling faster deployment of AI data centers through standardized design blueprints and power system planning.

Exhibit 47 : Valuation metrics for domestic companies pivoting towards data centers

(INR mn) Companies (Domestic)	CMP	Revenue					EBITDA					PAT					EPS					P/E					EV/EBITDA				
		FY24	FY25	FY26E	FY27E	FY28E	FY24	FY25	FY26E	FY27E	FY28E	FY24	FY25	FY26E	FY27E	FY28E	FY24	FY25	FY26E	FY27E	FY28E	FY24	FY25	FY26E	FY27E	FY28E	FY24	FY25	FY26E	FY27E	FY28E
L&T	4,076	21,91,157	25,42,087	29,12,000	33,65,000	38,72,000	2,35,013	2,64,577	3,02,781	3,52,351	4,11,668	1,24,650	1,41,451	1,79,176	2,16,566	2,58,222	89.6	102.8	129.0	156.3	186.6	45.5	39.7	31.6	26.1	21.8	25.5	21.3	20.9	17.9	15.3
Techno Electric & Engineering	1,195	14,976	22,428	34,558	46,313	54,639	2,094	3,393	4,932	7,390	9,762	2,410	3,192	4,992	6,467	7,994	22.4	28.1	44.4	58.6	68.7	53.4	42.6	26.9	20.4	17.4	33.6	25.9	21.2	14.1	10.7
Anant Raj	503	14,833	20,600	25,872	30,001	49,292	3,338	4,917	7,022	8,328	17,805	2,609	4,255	5,312	4,487	11,390	8.0	12.4	14.8	12.5	31.7	63.2	40.5	34.1	40.3	15.9	32.8	34.5	25.3	21.4	10.0
ABB	6,873	1,20,877	1,30,653	1,46,181	1,64,891	1,84,227	23,392	20,449	23,454	27,247	29,937	18,791	16,707	19,188	22,270	25,248	88.7	78.8	91.2	105.9	119.2	77.5	87.2	75.4	64.9	57.7	60.4	50.8	59.4	51.1	46.1
Hitachi Energy	28,435	52,375	63,849	78,091	1,14,255	1,56,635	3,494	5,965	11,672	17,976	25,875	1,641	1,845	9,661	13,706	19,356	38.7	90.5	218.0	307.6	434.1	734.6	314.3	130.4	92.4	65.5	84.9	88.4	103.4	67.1	46.6
CG Power and Industrial Solutions	748	79,558	98,147	1,24,114	1,57,927	1,97,199	10,985	13,053	16,047	21,959	28,686	8,102	9,451	12,027	16,001	20,822	5.3	6.2	7.7	10.2	13.2	140.9	121.0	97.4	73.7	56.5	72.0	73.7	70.4	51.5	39.4
Cummins India	5,003	90,002	1,03,907	1,20,370	1,38,230	1,57,285	17,697	20,279	25,376	29,572	34,517	16,803	19,609	23,802	27,121	30,976	60.6	70.7	86.6	99.2	114.0	82.5	70.7	57.8	50.4	43.9	45.6	39.0	53.9	46.2	39.6
Voltamp	9,530	16,162	19,342	20,984	24,737	27,882	3,212	3,662	3,734	4,247	4,642	2,591	2,914	3,397	3,741	4,058	256.1	288.0	335.7	369.7	401.1	37.2	33.1	28.4	25.8	23.8	30.2	19.3	24.9	21.9	20.0
GE Vernova T&D	4,135	31,624	42,900	62,352	79,889	1,01,928	3,193	8,188	16,109	19,131	23,941	1,342	6,084	12,262	14,433	17,873	5.2	23.8	47.8	56.4	69.8	789.0	174.0	86.6	73.4	59.2	67.8	48.2	64.9	54.6	43.7
Siemens Energy	2,918	NA	78,267	96,647	1,21,776	1,45,140	NA	15,135	19,443	25,146	30,216	NA	11,002	14,588	18,891	22,928	NA	30.9	40.5	52.7	64.1	NA	94.4	72.1	55.4	45.6	NA	78.6	49.6	38.3	31.9
KOEL	1,597	58,412	62,948	73,423	84,415	1,02,161	9,845	11,836	14,587	16,783	18,854	4,006	4,499	6,109	7,376	NA	27.6	30.9	38.7	44.8	NA	57.8	51.7	41.3	35.6	NA	15.4	12.6	17.6	15.3	13.6
TDPS	942	9,759	12,565	17,606	21,706	25,861	1,674	2,308	3,134	3,969	4,718	1,184	1,746	2,336	2,911	3,522	7.6	11.2	15.0	18.6	22.6	124.3	84.2	62.9	50.6	41.8	26.4	27.0	46.8	37.0	31.1
Apar Industries	11,207	1,61,530	1,85,812	2,25,280	2,61,657	3,02,117	15,282	15,474	18,292	20,921	24,486	8,202	8,174	9,884	11,235	13,484	210.8	203.5	246.8	280.2	336.2	53.2	55.1	45.4	40.0	33.3	18.2	14.1	24.9	21.8	18.6
Polycab	7,791	1,79,544	2,23,160	2,86,097	3,41,651	3,97,237	24,180	28,414	39,691	46,227	53,818	16,707	19,382	26,886	31,286	36,566	111.0	128.4	179.5	208.9	224.3	70.2	60.7	43.4	37.3	34.7	30.5	25.9	29.7	25.5	21.9
KEI Industries	4,599	81,207	97,359	1,17,692	1,41,765	1,69,314	8,546	9,903	12,238	15,161	18,532	5,812	6,959	8,968	10,584	12,778	64.3	75.5	94.4	111.5	134.6	71.5	60.9	48.7	41.3	34.2	35.9	26.2	29.3	33.9	27.4
Blue Star	1,805	96,854	1,19,677	1,26,508	1,47,932	1,72,066	6,724	87,923	9,035	11,182	13,668	4,050	5,700	5,368	7,241	9,029	20.3	27.7	26.8	35.1	44.1	88.9	65.1	67.5	51.4	41.0	38.6	49.0	39.1	31.6	25.8
Thermax	4,085	92,432	1,02,644	1,06,491	1,23,420	1,42,310	7,681	8,965	9,393	12,380	15,212	5,878	5,538	6,167	8,255	10,197	52.2	49.2	54.1	72.1	89.2	78.3	83.1	75.5	56.6	45.8	63.7	47.6	45.4	34.5	28.0
Praj	352	34,663	32,280	32,194	35,887	40,588	3,717	3,867	2,061	3,133	3,867	2,832	1,600	894	1,699	2,225	15.4	8.7	5.3	9.3	12.2	22.9	40.5	66.8	37.7	28.9	25.2	31.3	29.4	19.3	15.7
Voltas	1,402	1,24,074	1,53,205	1,46,141	1,74,763	2,01,460	4,750	11,304	7,864	12,422	15,376	1,539	7,129	5,621	9,606	12,221	4.7	21.5	16.9	29.1	37.2	301.5	65.1	83.0	48.2	37.7	75.8	42.6	56.3	35.6	28.8

Source: Company, PL

Exhibit 48 : Valuation metrics for Global companies pivoting towards data centers

$ mn Companies (Global)	CMP	Revenue					EBITDA					PAT					EPS					P/E					EV/EBITDA				
		CY24	CY25	CY26E	CY27E	CY28E	CY24	CY25	CY26E	CY27E	CY28E	CY24	CY25	CY26E	CY27E	CY28E	CY24	CY25	CY26E	CY27E	CY28E	CY24	CY25	CY26E	CY27E	CY28E	CY24	CY25	CY26E	CY27E	CY28E
AECOM	85	16,106	16,140	16,545	17,695	18,516	1,254	1,409	1,287	1,420	1,560	571	681.7	773	847	962.9	4.2	5.1	6.0	6.7	7.7	20.4	16.6	14.3	12.8	11.1	13.4	14.2	9.9	9.0	8.2
Schneider Electric	268	41,273	45,388	43,121	46,745	50,693	8,887	9,852	9,323	10,462	11,733	4,809	5,019.0	5,523	6,377	7,288.0	8.5	8.8	9.8	11.3	13.0	31.6	30.4	27.5	23.7	20.7	18.5	17.8	17.1	15.3	13.6
Eaton	401	24,878	27,448	30,597	33,470	37	6,017	6,964	7,422	8,457	9,494	3,980	4,480.0	5,139	5,917	6,750.0	10.0	11.5	13.2	15.3	17.5	40.2	35.0	30.4	26.2	23.0	29.7	25.4	22.2	19.5	17.3
Vertiv	295	8,012	10,230	13,615	16,806	19,438	1,726	2,311	3,215	4,251	5,156	502	1,433.6	2,367	3,107	3,814.0	1.3	3.7	6.1	8.1	9.9	226.9	80.4	48.3	36.5	29.7	26.3	28.2	34.6	26.1	21.6
ABB	72	30,583	33,220	36,533	39,048	41,465	5,771	6,449	8,055	8,552	9,168	4,117	4,351.6	5,636	5,822	6,282.0	2.2	2.4	3.1	3.2	3.6	32.6	30.4	23.6	22.5	20.4	18.6	20.3	21.0	19.7	18.4
Carrier Global	65	22,486	21,747	21,923	23,079	24,336	3,231	3,640	4,693	4,818	5,449	1,451	1,540.6	2,328	2,601	2,913.0	1.6	1.8	2.8	3.2	3.6	40.4	36.1	23.2	20.3	17.8	18.9	15.9	13.1	12.8	11.3
Trane Technologies	470	19,838	21,322	23,167	25,029	26,992	4,089	4,565	4,755	5,207	5,833	2,589	2,936.1	3,297	3,700	4,133.0	11.3	13.1	14.8	16.8	19.1	41.5	36.0	31.7	28.0	24.6	24.6	22.5	22.0	19.9	18.0
Johnson Controls	142	22,952	23,596	25,123	26,730	28,222	3,329	4,254	4,543	5,107	5,605	1,290	2,127.0	2,901	3,333	3,773.0	1.9	3.3	4.7	5.6	6.3	74.3	43.7	29.9	25.6	22.5	18.9	18.3	20.8	21.2	18.9
GE Vernova	987	34,935	38,038	44,427	50,630	57,417	2,069	2,637	5,771	8,635	11,789	1,889	5,023.0	3,892	5,933	8,089.0	6.8	18.2	14.3	22.2	30.8	145.4	54.3	68.9	44.5	32.1	40.8	64.3	44.8	44.9	30.0

Source: Company, PL

Analyst Coverage Universe

Sr. No.	Company Name	Rating	TP (INR)	Share Price (INR)
1	ABB India	Accumulate	6319	6614
2	Apar Industries	Accumulate	9629	10767
3	BEML	Accumulate	1922	1603
4	Bharat Electronics	REDUCE	411	440
5	BHEL	HOLD	245	277
6	Carborundum Universal	HOLD	825	855
7	Cummins India	Hold	4182	4907
8	Elgi Equipments	Accumulate	603	500
9	Engineers India	Buy	261	209
10	GE Vernova T&D India	Buy	4050	3911
11	Grindwell Norton	Hold	1731	1488
12	Harsha Engineers International	Hold	409	349
13	Hindustan Aeronautics	BUY	5338	4033
14	Hitachi Energy India	Hold	26108	27315
15	Ingersoll-Rand (India)	Buy	4589	3798
16	Kalpataru Projects International	Buy	1466	1143
17	KEC International	Accumulate	748	578
18	Kirloskar Pneumatic Company	BUY	1556	1170
19	Larsen & Toubro	BUY	4806	3896
20	Praj Industries	Accumulate	340	337
21	Siemens	ACCUMULATE	3409	3223
22	Siemens Energy India	Accumulate	3145	2768
23	Thermax	Accumulate	3374	3535
24	Triveni Turbine	Accumulate	585	455
25	Voltamp Transformers	BUY	10312	9079

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Reduce	:	-5% to -15%
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