LARSEN & TOUBRO

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Sustainable Hyperscale: Powering AI Data Centers Without Breaking the Grid

Executive Summary

Artificial intelligence is rapidly increasing the demand for high-performance computing infrastructure. As organizations deploy advanced AI workloads, hyperscale data centers are becoming a critical part of digital infrastructure. However, the scale required to support AI also introduces challenges related to energy consumption, water usage, infrastructure expansion, and environmental compliance.

Enterprises are therefore looking for infrastructure models that balance performance requirements with responsible resource usage. Sustainable design, efficient energy sourcing, and environmental governance are becoming essential considerations when building and operating large-scale data center environments.

Larsen & Toubro-Vyoma addresses these requirements through a sustainability-focused infrastructure approach that integrates renewable energy sourcing, environmentally responsible facility design, and long-term environmental commitments. By combining hyperscale infrastructure capabilities with sustainability principles, Larsen & Toubro-Vyoma aims to support the growth of AI infrastructure while minimizing the pressure placed on energy grids and natural resources.

The Sustainability Challenge in AI Infrastructure

The growth of AI technologies across sectors such as financial services, manufacturing, healthcare, and digital platforms is increasing the demand for compute-intensive environments. Training and operating large AI models requires infrastructure capable of handling dense computing workloads and large volumes of data.

This rapid expansion of computing capacity creates new operational considerations for data center operators. High-performance infrastructure must maintain consistent availability and scalability while managing energy consumption and resource usage responsibly. As hyperscale infrastructure continues to expand, organizations must address how data centers can grow without placing excessive strain on power systems or environmental resources.

Sustainability is therefore emerging as a critical factor in infrastructure planning. Enterprises increasingly expect data center environments to combine performance, operational reliability, and responsible environmental practices.

Key Customer Challenges

Organizations expanding AI infrastructure commonly face several operational and sustainability challenges. These include-

1. Sustainability Pressures

Enterprises are under increasing pressure to align infrastructure operations with sustainability commitments and environmental responsibility goals.

2. Infrastructure Scalability

AI workloads demand large-scale compute environments that must expand reliably without compromising operational stability.

3. Cost Management

Energy consumption and infrastructure expansion contribute significantly to operational costs, making efficiency and optimized resource usage key considerations.

4. Compliance Requirements

Data center environments must operate within evolving regulatory frameworks related to environmental standards and responsible infrastructure practices.
Addressing these challenges requires infrastructure strategies that integrate sustainability, scalability, and operational efficiency.

Larsen & Toubro-Vyoma's Sustainability Approach

Larsen & Toubro-Vyoma incorporates sustainability considerations into the design and operation of its data center infrastructure. The approach focuses on responsible resource management and environmentally conscious facility development.

1. Water Management Systems

The infrastructure incorporates sewage treatment systems and a net-zero water management approach.

- ***100% wastewater is treated on-site using a dedicated ZLD STP and reused for flushing and irrigation.***
- ***A 400 KL rainwater storage sump supports up to 40 days of data center water requirements.***
- ***Low-flow fixtures and water-efficient landscaping reduce overall water consumption.***
- ***Air-cooled chillers eliminate the need for cooling tower makeup water, further conserving water.***

2. Renewable Energy Integration

Energy sourcing includes renewable and clean power sources.

- ***Approximately 30% of total energy requirements are met through renewable energy.***
- ***A 200 KWp rooftop solar plant supports on-site clean energy generation.***

3. Green Building Infrastructure

Facilities incorporate green building practices and environmental design standards.

- ***Certified under IGBC Green Data Center- Platinum Rating***
- ***ISO 14001 (Environmental Management System)***
- ***ISO 45001 (Occupational Health & Safety Management)***

4. Climate-Conscious Infrastructure Design

Operational design incorporates environmentally responsible technologies.

- ***Air-cooled chillers using R134a refrigerant, a safer environmental alternative***
- ***-Inert gas-based fire suppression system (IG541) with zero ozone depletion potential and no global warming impact***

5. Low-Carbon Infrastructure Design

Operational practices prioritize energy-efficient systems and infrastructure design approaches aimed at supporting lower-carbon data center operations.

Energy Optimization and Infrastructure Efficiency

Operating hyperscale AI infrastructure requires efficient energy management. Larsen & Toubro-Vyoma addresses this through optimized energy sourcing strategies that combine grid power with renewable energy inputs.

- ***30% renewable energy contribution to total energy requirements***
- ***Use of energy-efficient equipment across infrastructure***
- ***All chiller primary pumps equipped with Variable Frequency Drives (VFDs) for optimized energy usage***
- ***Equipment such as Fan Wall Units, PAHUs, ventilation fans, and condenser fans utilize EC fan technology, enabling variable speed operation and improved efficiency***

These measures improve operational efficiency while supporting the performance requirements of AI workloads.

Future Sustainability Roadmap

As demand for AI infrastructure continues to grow, Larsen & Toubro-Vyoma has outlined sustainability initiatives aimed at strengthening environmental performance across its infrastructure footprint.

1. Mahape Green Data Center

The development of a green data center in Mahape represents a step toward building infrastructure aligned with sustainability and efficiency goals.

2. Carbon Neutrality Target

The organization has set a target of achieving carbon neutrality by 2035, reflecting a long-term commitment to reducing the environmental impact of infrastructure operations.

3. Water Neutrality Goal

A water neutrality target for 2040 further supports responsible resource management in future infrastructure development. These initiatives indicate a long-term roadmap focused on supporting hyperscale computing growth while maintaining sustainable infrastructure practices.

Conclusion

The expansion of artificial intelligence infrastructure is reshaping the requirements of modern data centers. Hyperscale environments must now support increasingly intensive workloads while maintaining responsible resource usage and environmental accountability.

By integrating renewable energy sourcing, water management systems, green building standards, and long-term sustainability goals, Larsen & Toubro-Vyoma aims to support the development of AI infrastructure that balances performance with environmental responsibility.

Sustainable hyperscale infrastructure will play an important role in enabling organizations to scale AI capabilities while managing the broader impact of large-scale computing environments.

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