August 2026

DCD >eBook

Constructing the data center

Examining speed, steel, safety and sustainability

NEW MILLENNIUM
A Steel Dynamics Company

Growing an enterprise requires bold moves.

Project timelines become unstable when structural steel is treated as a commodity.

Early collaboration with New Millennium can strengthen your entire construction schedule.

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Maximize your volume-based purchasing power.

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Let's discuss your pipeline and how our program fits your vision:

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Introduction

According to McKinsey, global data center capacity is projected to nearly double, from roughly 100GW to 200GW by 2030, with AI representing roughly half of all compute workloads within the same timeframe.

With 2030 a mere four years from now, the race is on to build the highly specialized facilities necessary to house and run the infrastructure that underpins this innovation. And as AI continues to infiltrate every facet of our everyday lives, governments the world over now consider them critical national infrastructure, highlighting how crucial these once overlooked buildings really are, not only to business success, but life as we know – and will come to know – it.

Unfortunately timelines for data center construction, particularly at the hyperscale level required for technology of this scale can be lengthy, with many developers now opting for a prefabricated approach in order to help expedite the process. That said, this need for speed cannot come at the cost of safety nor sustainability, particularly when dealing with facilities that are so energy intensive.

From streamlining the supply chain, to lessons in safety, steel and sustainability, in this eBook we examine how implementing the right technology and partnering with the right third-parties can support you with your construction projects from concept to completion, getting you up and running without compromise or catastrophe.

Racing against time: how technology is accelerating data center builds

The digital tools speeding up construction

Duane Gleason,
Trimble

By 2035, Deloitte estimates that power demand from artificial intelligence (AI) data centers in the United States could grow more than thirtyfold. The digital economy, fueled by cloud computing and AI, has created a sense of urgency among hyperscalers and colocation providers competing to seize market share. The result? A race to build data centers at a pace typically unheard of in construction.

Most of us see data centers seemingly appear overnight, but few understand the coordination, expertise, and technology required to achieve such rapid deployment.

Balancing speed, scale, and scarcity

Hyperscalers, AI firms, cloud providers, and data center operators are pushing for data centers to be operational in 12 to 14 months, nearly double the pace of a typical construction project.

To keep pace with demand, Meta is housing servers in massive temporary tents while permanent data centers are under construction. These structures enable the company to deploy racks of servers and start training AI models months before traditional brick-and-mortar campuses are ready. Outfitted with power, cooling

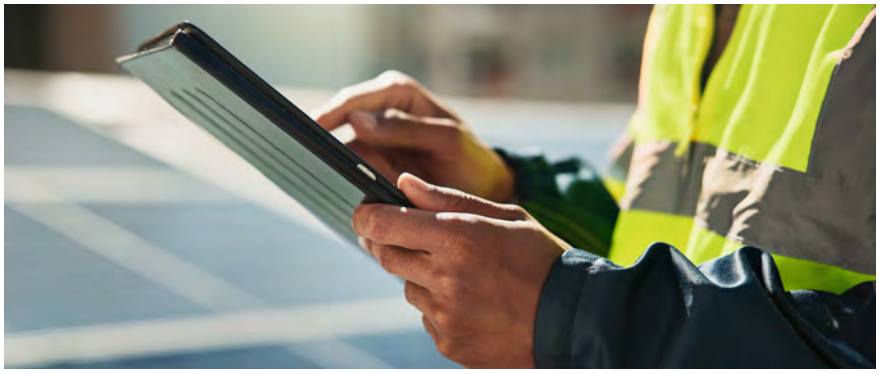
systems, and networking infrastructure, the tents are engineered to handle high-density workloads in the short term. Meta's strategy underscores the urgency of scaling and the constraints developers face in new data center construction and expansion.

Not only are timelines accelerated, but their complexity is underscored by the construction industry's shortage of skilled labor. While the details may vary, the perspective of most construction teams follows the same plot; "we have (insert hyperscaler/provider) that is building a new data center complex outside of (insert a town you've never heard of) in the middle of (insert remote state/province) and we need to start in one week with 150 people, scale up to 500 people in 60 days, and peak at 1,500 plus craft workers in the next six months."

The coordination required to quickly assemble subcontractors, material, equipment, and labor, all with varying skill sets and experience, in remote locations in a matter of days or weeks, to then mobilize hundreds of craft workers at a time, is nothing short of herculean.

No room for interpretation or errors

On the construction site, the pace is relentless. Delivering projects on time means that work never stops or stalls. Losing even a few days of production can equate to millions in lost revenue opportunities.



There is no time to pause for lengthy debates about how work should be done. Crews working in the field have to trust that every design is constructible and that each task is executed exactly as planned. To keep the project on track, any changes that arise during construction have to be captured immediately and communicated broadly to all stakeholders.

Any misstep in one area can cause a cascading delay across the entire project. At the same time, productivity challenges and delays due to missing or incorrect data, project mistakes, and field conflicts can derail projects quickly.

Overcoming these challenges requires breaking down silos to improve communication and transparency, leading many contractors to work in a cloud-based common data environment (CDE) that unifies 3D models, drawings, layout information, and scan data into a single source of truth. Within it, everyone has real-time access to the most current information for informed decision making, tighter collaboration, and fewer errors in the field.

Most data center projects have dozens of layout engineers, not to mention hundreds or thousands of craft workers. A CDE is the conduit between them, removing the need for manual communication methods and enabling them to work quickly with confidence.

Connecting technology, people, and processes enables real-time progress tracking, giving every stakeholder a clear understanding of a project's current status. Issues are resolved faster because challenges are identified and resolved in real-time and before they escalate. Teams make decisions, from daily operations to strategic planning, based on timely, accurate data. Resources are optimized to avoid idle time and increase productivity across the board. And, jobsites run more smoothly because everyone involved has a comprehensive understanding of the work to be done at any given moment.

Digital tools driving data center delivery

It isn't just CDEs that are vital to delivering data centers efficiently; a wide range of technologies, such as robotic

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> Trimble

layout, 3D scanning, and augmented reality, all play a role in delivering these complex projects quickly.

- **Building Information Modeling (BIM):** BIM is the digital backbone of complex data center projects. Data-rich 3D models bring together architectural, structural, and mechanical systems for coordination and detailing. Design changes are immediately propagated across 3D models and accessible to all team members, which prevents outdated information from leading to errors that delay work. The metadata within the model is used both upstream and downstream throughout the project and after project completion, for operations and maintenance.

- **Field technology:** Robotic total stations and GPS-enabled survey equipment, driven by design data from the model, ensure precise and efficient layout of foundations, walls, utilities, and more. Field teams can access design files directly from their devices, which ensures everyone is working from updated and accurate information. 3D laser scanners then capture highly accurate point cloud data as the work is put into place. Point clouds are compared to 3D models to verify accuracy, detect deviations, and track progress.

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Information gathered in the field via connected equipment is then sent to the office, where 3D models are updated based on as-built information, which is continuously made available to the multitude of teams installing the work.

- **Project management software:** Project managers have access, both in the office and in the field, to the information they need to track progress against the master schedule, identify potential delays, make proactive adjustments, and resolve issues fast. With real-time financial visibility, project managers monitor budgets, track expenses, and manage change orders. Project documents, drawings, Requests for Information (RFIs), and submittals are centralized and accessible, which ensures everyone is working from the latest versions.

Field data captured from daily logs, machine telematics, and progress photos gives project managers a holistic view of jobsite performance, so they can make data-driven decisions that keep the project on track and within budget.

Teams in the field can simply open their tablet and, in seconds, visualize and validate if work is correct and on track, down to every embed plate, piece of rebar, conduit, pipe, and cable tray.

A blueprint for speed and accuracy

The race to build data centers is not just about working faster; it's about working smarter. Compressed timelines, complex systems, and high stakes require a coordinated technology-enabled approach. By improving collaboration, accuracy, and predictability, technology is helping the industry meet growing demand without sacrificing quality or performance.

The forces behind faster data center builds are people and technologies that enable coordinated digital workflows, teams, and data. Although the industry isn't often seen as leading in technology adoption, the intense speed and complexity of data center projects paint a clear picture of how construction businesses are advancing through technology. ■

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Constructing data centers against the clock

Erika Chaffey,
DCD

Why early engagement in securing critical structural materials at scale is central to meeting today's demand for increased speed to market

As technology cycles accelerate at an unprecedented pace, getting up and operational ahead of the next wave of change has never been more critical – or more challenging.

Across the data center ecosystem, pressure is mounting on multiple fronts. Supply chains are increasingly constrained, skilled labor is stretched thin, and lead times are volatile. And yet, despite this complex landscape, the demand for accelerated speed to market shows no sign of waning.

Amid the excitement surrounding the newest compute capabilities and the next-generation infrastructure that will support it, one essential element that often goes underappreciated is the time, planning, and critical decision-making required to construct the right foundations of the facility itself.

Securing future-ready power and cooling systems along with the latest rack architectures means little if the structure that houses these components is unfit for purpose – or worse, not ready when it's needed.

In today's environment, bottlenecks and unexpected hurdles along project timelines are inevitable. New Millennium is focused on ensuring that securing the right construction materials when they're required is not the pebble on the tracks that derails or delays new facilities from meeting strict schedules.

Sean Smith, market development manager at New Millennium, explains how the company is helping owners and developers accelerate speed to market via its comprehensive delivery model and the flexibility of flush frame composite joists for modern data center construction.

It's all in the foundations

While structural steel may not be the most visible or glamorous component of a new data center project, it's nonetheless fundamental to meeting aggressive timelines and ensuring long-term

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> New Millennium

durability. Smith emphasizes that early engagement is critical to unlocking its full value:

"One of the advantages of engaging with a national company like New Millennium is the ability to lock in pricing. We tie costs to an index from the outset to provide security and transparency. Customers can track when things move up or down but are protected from major market fluctuations."

In a volatile materials market and a pressurized landscape, cost certainty provides much-needed peace of mind. Early engagement also allows production slots to be secured in advance, ensuring steel is delivered precisely when it's needed.

Owners and operators can share projected tonnage and anticipated build locations for the coming years – group these requirements, and secure both pricing and scheduling in advance. This comprehensive approach strengthens planning and reduces the risk of delays and unexpected costs.

New Millennium works closely with structural engineers to streamline designs based on specific business requirements and long-term scalability needs. These relationships are essential for optimizing efficiency and aligning structural solutions with unique operational goals.

"One of the biggest challenges data centers face is permitting," adds Smith. "Organizations often have to pivot from their original plans to build in one location in favor of another. If we're engaged early, we can pivot with you. But if steel decisions are made later on in the process, then your project enters the queue in sequence, risking drawn out timelines. It's a very collaborative process."

An owner-negotiated contractor-procured (ONCP) agreement can formalize pricing and scheduling commitments well before final structural drawings are complete. Smith expands on what best practice looks like:

"Ideally, customers bring us in on project plans – however many facilities and over whatever timeline that may represent – before structural drawings are even finished. You might only have site plans and high-level information, but that's enough for us to start scheduling and pricing discussions. We can leverage the total tonnage across all proposed projects nationwide into guaranteed pricing."

In warehouse construction, structural steel often represents a significant percentage of total building cost, so it takes a front seat in design and planning. In data centers, steel may represent a smaller percentage compared to the volumes of IT equipment, power systems, and cooling infrastructure that characterize modern operations. As a result, it can often be left to the last minute.

"We're a smaller line item compared to racks and CPUs," says Smith. "But the building is what supports and protects the significant investments inside it. Getting that structure right and getting it up on time is crucial."

Good bones

For decades, wide flange beams have been the go-to solution in data center construction. They offer strength and stability to support heavy equipment loads and enable the large spans required for expansive white space. But as project demands evolve across the data center ecosystem, traditional solutions are increasingly struggling to keep pace.

Modern facilities require structures capable of supporting heavier loads, accommodating future equipment upgrades, achieving greater heights and spans, and adapting to increasingly complex mechanical and electrical systems – all while navigating supply chain constraints and compressed schedules.

"We're seeing an incredible amount of pressure building from hyperscalers, data center owners, and developers to get their buildings up and running as quickly as possible," says Smith.

"There are fewer wide flange manufacturers compared to joist manufacturers, and so with the surge in data center demand, wide flange lead times are extending significantly

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This is where structural steel – specifically flush frame composite joists – emerges as the ideal solution for balancing the durability, speed, and adaptability modern construction projects demand.

"Structural steel provides a level of strength and stability that wood and concrete simply can't match," says Smith. "It also offers strong sustainability credentials and flexibility for future loading requirements."

Flush frame composite joists differ from traditional wide flange beams in a few key ways. Wide flange beams are solid members, while composite joists feature an open web system. Despite weighing less, joists can provide equivalent structural performance in terms of vibration control and load capacity.

The open web design reduces material usage – enhancing sustainability while maintaining strength. One of the most significant advantages lies in coordination with mechanical, electrical, and plumbing (MEP) systems, as Smith notes:

"A critical benefit of composite joists is the ability to pass MEP systems directly through the web openings. That streamlines construction and improves efficiency when erecting and integrating the building."

By allowing cabling, piping, and high-density services to pass through the structure rather than below it, flush frame systems help reduce overall building height requirements. This can translate into cost savings and improved spatial efficiency inside increasingly complex high-density environments where every inch matters.

As composite joists are physically lighter, they're also easier and faster to transport and install. More material can be shipped per load, and erection timelines are streamlined. In today's competitive, high-stakes landscape, these efficiencies compound to deliver a valuable strategic advantage.

The digital advantage

Digital transformation isn't confined to server racks and AI workloads – it's reshaping

construction workflows and optimizing the very structure of the data center, too.

Advanced modeling platforms and building information modeling (BIM) processes enable more precise coordination between structural and MEP systems. New Millennium utilizes Tekla for BIM workflows, plus proprietary plugins tailored to joist systems.

"One of the historical coordination challenges with steel joists is that web layouts are not fully finalized until shortly before fabrication," explains Smith. "When we're involved early, we can lock those panels in and therefore MEP teams know exactly where systems will run."

Unlike beams, joists are highly engineered components with no single

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top chord, bottom chord, or web configuration that fits every setup. As loads increase or decrease, each joist must be individually optimized. This engineering flexibility is a key strength – but it also requires close coordination.

By integrating Tekla models from structural engineers with internal design software, New Millennium can finalize joist optimization earlier in the approval process. This allows MEP teams to design around fixed structural conditions – reducing clashes, extended redesigns, and field modifications to ensure swift installation and overall project delivery.

Smith also stresses the importance of simultaneous collaboration across the chain: "Bring your MEP contractor in with us and the structural engineer at the same time. If all three groups are at the table early, we can resolve issues much more efficiently than working in isolation at different stages."

For many construction projects, MEP systems are released later in the schedule, creating downstream coordination risks. Early cross-disciplinary engagement mitigates these risks and supports a smoother, quicker path to commissioning.

The big picture

"We understand that construction materials aren't always at the top of the priority list," reiterates Smith. "Components like switchgears or transformers often have the longest lead times and demand early attention. But engaging structural partners early ensures steel doesn't become another bottleneck."

Providing owners and developers with direct access to structural expertise is now mission-critical. Data center campuses represent increasingly significant investments, meaning the structure that protects those assets must be adaptable and proven.

Looking ahead, Smith sees both opportunity and challenge. In regions where land and power are abundant, single-story facilities that distribute loads directly to slab-on-grade foundations may become more common. While in markets, such as Virginia, where land is scarce and demand remains high, multi-story data centers will likely continue to be the norm.

Ever-increasing densities will continue to bring new structural challenges. As AI workloads grow, so does the volume and complexity of the infrastructure. Liquid cooling systems, for instance, are already introducing additional weight compared to traditional air-cooled setups.

"These cooling loads and AI-driven densities are pushing the boundaries of all construction types – whether for wood, concrete, or steel," notes Smith. "As racks get heavier and cooling systems expand, we have to continue innovating to support those demands."

Extending innovation beyond the physical materials, New Millennium is investing in advanced technologies, including AI-driven tools, to enhance internal workflows and improve collaboration with engineering partners. Seamless, real-time model integration will help eliminate the inefficiencies of redrawing from static PDFs and enable smarter coordination.

"The sooner we collaborate and understand our partners' pain points," says Smith, "the better positioned we are to develop the right solutions and deploy at pace."

In an industry increasingly defined by speed, complexity, and relentless technological advancement, the foundational elements of data center construction cannot be an afterthought. Structural systems must be strong, adaptable, and delivered on time – capable of supporting today's loads and adapting to future innovations. ■

Make the bold move and take control of predictability. Contact Sean Smith to talk about your pipeline and how New Millennium's program fits your vision: 618-694-5610 || sean.smith@newmill.com

Fixing the supply chain: Why data center construction needs a more collaborative approach

How timely completion can be achieved using integrated project delivery

Derek McNamara,
Linesight

As demand for data centers has surged, so, inevitably, have challenges around delivery. Lead times for some essential equipment have doubled since 2022, and costly delays caused by legal disputes with contractors have risen sharply. It doesn't help that traditional procurement models push most of the risk onto suppliers, leading to bottlenecks and cost overruns.

But there is a solution, and one that can be deployed without having to compromise on the scale of ambition for data centers. Timely and cost-efficient project completion can be achieved using an approach called integrated project delivery (IPD).

Working together wins every time. A poll by McKinsey of more than 100 businesses and organizations across multiple sectors revealed that those companies that regularly collaborated with suppliers could demonstrate higher growth, lower operating costs, and greater profitability than their industry peers.

What is it

IPD's big advantage is in bringing together project stakeholders, including suppliers, contractors, and developers, early in the proceedings to improve planning. This collaborative approach shifts a project from being a potentially adversarial situation to one of shared risk and reward, creating stability among project parties. It can also encourage long-term supplier agreements, reduce lead times, and, crucially, lower cost volatility.

> **"Using IPD allows for better supply chain visibility and lowers last-minute procurement delays. By helping to forge stronger supplier and contractor relationships, such collaboration creates more reliable, scalable supply chains."**
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> Linesight

For this to manifest itself across data center delivery, developers must lead the process by putting in place more cooperative contracts as part of an IPD approach. The days of combative relations among stakeholders have to be a thing of the past.

Risk

By harnessing IPD, risk and reward across the supply chain can be better balanced. Currently, standard contracts push all the risk onto suppliers and trade partners. This often results in defensive behaviour, with disputes, claims, and delays likely to loom large as the project develops.

For the clients, this will see a move from one main contractor (single point of contact) to multiple contractors responsible for smaller portions of the work. These relationships will need to be managed and coordinated to ensure sufficient collaboration and information sharing is in place.

Adopting IPD will require a shift in mindset since it relies on a more open, trust-based approach. While IPD can make a significant difference, it is important to recognise there will be resistance to change, along with a default to the familiar way of doing things, even if this results in project delays and cost overruns. If it is to succeed, it must embrace greater supply chain transparency and early planning.

Procurement attitudes also need to change. Buying teams should be measuring success

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> Linesight

based on final project cost certainty, not just upfront savings which can – and often do – fall by the wayside.

Reward

Looking ahead, should more of the industry move towards delivery through IPD, the supply chain will inevitably become increasingly digitized, utilizing cloud technology and just-in-time strategies while also creating a greater degree of competition in that part of the market. Consequently, the more it is adopted, the more the market will grow to ensure there is an optimum match between supply and demand.

Using IPD allows for better supply chain visibility and lowers last-minute procurement delays. By helping to forge stronger supplier and contractor relationships, such collaboration creates more reliable, scalable supply chains.

Flipping the Switch

There are those who mistakenly believe that by using IPD, they will deliver projects more cheaply. This is missing the point of IPD, which is designed to give greater cost and program certainty from the outset, avoiding a race to the bottom on pricing, along with the claims, delays, and additional costs that often follow.

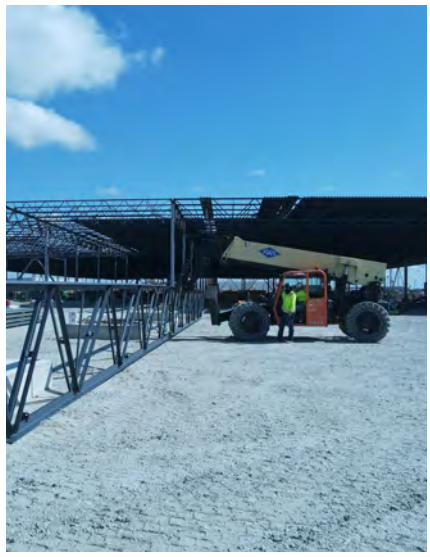
Conversely, IPD ensures that cost, risk, and profits are shared fairly, making projects more stable and predictable. With IPD, contractors and suppliers are incentivised to focus on overall project success, not just their own survival.

IPD works most effectively when there is a pipeline of work available, since it takes significant effort – both in time and money – to set up operations and governance structures to effectively deliver a project using this approach.

It is also important that clients are on board with IPD. Clients need to drive behaviors that focus on the project's delivery, not those which put all the risk onto the supply chain.

For supply chain management, IPD has the potential to solve many of the current challenges by providing greater efficiency, predictable costs, shorter timelines, and, ultimately, more much-needed data centers.

For some, modularization is the next natural step in this journey to optimize data



center construction. This slots nicely with the IPD models, moving more of the traditional trades work off-site and into a controlled environment within the vendors' or integrators' facilities. This offers the opportunity to reduce schedule time on-site and helps increase first-time quality. The flipside to this is that much of that schedule risk can become less visible to the client, so once again, enhanced trust is required amongst all project parties.

IPD is not a one-size-fits-all approach. It will require decisions be made with a project-first focus, requiring strong stakeholder collaboration, where trust and transparency are vital. However, Linesight has witnessed that once adopted, properly governed, and embedded operationally, IPD can be remarkably successful. ■

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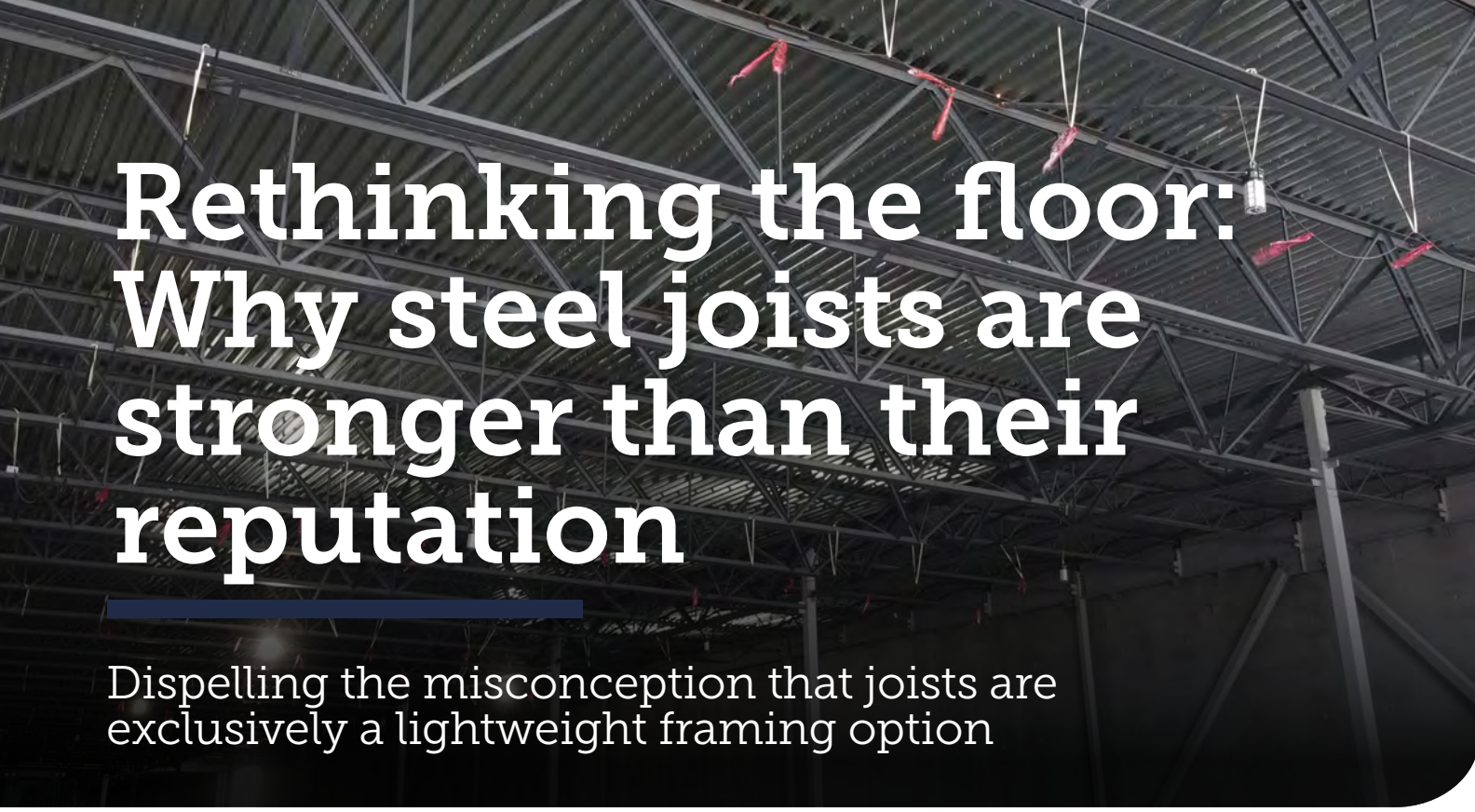


Rethinking the floor: Why steel joists are stronger than their reputation

Dispelling the misconception that joists are exclusively a lightweight framing option

When it comes to data center construction, there's a common preconception that steel joists are best suited for roof framing systems, while beams should be used for flooring because of their strength and durability in managing the ever-increasing loads of modern data centers.

For decades, this assumption has steered many structural decisions, and by default, roofs have typically been seen as the natural home for joists, while floors expected to carry heavy equipment were typically associated with beam systems.

But as AI and advanced compute continue to push traditional strategies and long-established solutions beyond their limits, every corner of the data center – from floor to ceiling – is being reimagined.

This raises an important question: why does this belief exist around joists versus beams, and does it still hold up in modern environments?

For Dennis Montgomery, S.E., P.E., marketing engineer at New Millennium, the answer is straightforward:

"In reality, there's no solid technical reason behind this preconception – other than that it's how things have always been done. People often look at roof joists and assume they're lightweight members that don't have sufficient capacity for data center floors. But that simply isn't the case."

New Millennium produces open web steel girders – larger, higher-capacity members – at the same facilities where its joists are manufactured. This flexibility means open web steel joists can be designed and fabricated to meet significantly greater load requirements than many engineers initially expect.

By dispelling the misconception that joists are exclusively a lightweight framing option, Montgomery highlights the benefits of steel floor joists with flush frame connections, and why engineers and operators should think twice before defaulting to traditional beam systems.

Robust by nature

Recognizing the potential of steel floor joists begins with understanding the structural advantages. Wide flange beams typically come in depths of around 40-44 inches, whereas steel joists can easily double this depth.

"That's a critical advantage," says Montgomery. "Depth plays a major role in determining how much load a member can take and the spans it can achieve."

Greater depth improves stiffness and load capacity, which in turn enables longer spans between structural supports. In data center design, this can create valuable flexibility in how floor space is laid out, helping engineers accommodate equipment, cooling systems, and cable infrastructure without added structural interference.

The open web structure of steel joists also provides inherent advantages for routing mechanical, electrical, and plumbing systems. Services can pass through the joist web rather than below it, helping reduce floor-to-floor height requirements and improving space efficiency inside the facility.

However, the choice between beams and joists ultimately depends on several project-specific factors. One of the most important distinctions is between composite and non-composite systems.

Composite joists and composite beams both utilize the concrete floor slab for compressive strength. Via shear connectors or other mechanisms, the steel member and concrete slab act together as a single structural unit to deliver a system with greater strength and stiffness – often also in a smaller size while maintaining the required capacity.

"The only time we typically recommend a non-composite design is for very short spans where the additional complexity isn't necessary," explains Montgomery. "For spans under about 20 feet, it may be more economical to avoid composite solutions. But once you get into larger spans and higher load capacities – say 30 feet or more – you're usually better off with a composite system."

Connecting the dots

Flush frame connections play a key role in maximizing the performance of steel joist floor systems. They ensure the top of the joist aligns with the top of the wide flange girder – and this alignment enables the girder to act compositely with the concrete floor slab.

In traditional joist seat connections, the joist sits on top of the girder, preventing it from participating in composite action with the slab.

"Lowering the joist into a flush frame connection allows the girder to engage with the concrete slab," explains Montgomery. "That composite action creates a more efficient and economical system."

The connection also improves vibration performance. As the joist connects flush with the girder and effectively ties together consecutive bays of joists – the floor system becomes more robust and better equipped to resist vibration.

In modern data centers, where heavy equipment, cooling systems, and dense infrastructure place constant stress on the floor, vibration control is a critical consideration for long-term durability.

Made for today and tomorrow

In today's high-stakes, constantly shifting landscape, strength alone is no longer enough, just as deploying next-generation rack and cooling architectures doesn't automatically guarantee long-term scalability if the underlying floor system isn't designed with future growth in mind.

"When specifying open web steel joists in data centers, we start with the anticipated dead and live loads," says Montgomery. "But inevitably, additional weight gets added as mechanical piping, electrical systems, and other equipment are incorporated throughout the project lifecycle – sometimes even after joists are fabricated."

To manage this uncertainty, steel joists are often specified with an additional load allowance, or add-load, during the early design stage. This ensures the floor system has built-in capacity for future modifications or unforeseen equipment changes.

"We strongly recommend incorporating an add-load into all designs," says Montgomery. "And it can be substantial – around 5,000 pounds or more – to provide the flexibility data centers increasingly need."

Collaboration is key

Securing this built-in scalability requires early collaboration between key stakeholders – including engineers, structural designers, and manufacturing teams.

The engineer of record has the best understanding of what the add-load should be, based on the intended function of the facility and potential plans for future expansion. Meanwhile, the joist designer understands the practical implications for fabrication, installation, and structural performance. Aligning this information is central to achieving the right flexibility.

"We can design for the required capacity," explains Montgomery. "But we need to evaluate the impact on joist availability, production schedules, and overall weight. Working closely with the engineer of record allows us to provide feedback early in the planning process."

This knowledge sharing also helps to prevent costly redesigns or delays later on in the construction process. And collaboration doesn't end at individual stakeholders. It also extends to the digital tools that help streamline design and decision-making.

"At New Millennium, we work with joists every day, and we have tools that can help in the early design stage," says Montgomery. "The steel joist institute (SJI) floor bay comparison tool is particularly useful for determining whether joists or beams will be the most effective solution for a specific floor system."

These tools allow engineers to explore multiple structural scenarios, perform value engineering, and evaluate both structural efficiency and scheduling implications. For engineers who may not frequently specify composite floor joist systems, digital modeling can also provide early insight into all-important floor vibration performance.

Collaboration is also central to delivering on demand for accelerated speed to market. While both beams and joists sit within a broader structural ecosystem where the goal is to identify the right solution for the specific demands of the project – lead times play a significant role in deciding between the two.

Several years ago, during the Covid-19 pandemic, lead times for joists grew to over 30 weeks. Yet today, turnaround times for steel joists from New Millennium sit at 12-20 weeks, depending on project complexity and location.

And even while most joists are customized, lead times are relatively quick because materials are ready and waiting at the fabricator. This means that by engaging with an expert supplier at the design and planning stage, operators can benefit from both a tailored solution and fast deployment, helping to meet rising pressure to become operational at pace.

"When we align early, we can identify solutions that keep projects on schedule," adds Montgomery.

Delivering long-term value

As high-density AI workloads continue to increase the size, volume, and weight of the infrastructure that supports it, meeting both today's and future load requirements on facility floors is a critical challenge that often goes under the radar during early planning stages.

But Montgomery concludes with confidence that a combination of early planning, cross collaboration, and digital coordination makes future adaptability far more achievable:

"What we often see is that once the add-load capacity is included, owners can adopt mechanical units, piping systems, or other infrastructure down the line without having to worry about the flooring system or accounting for costly and time-consuming modifications down the line."

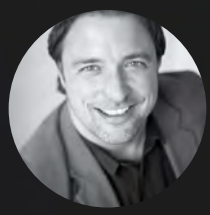
BIM modeling is central to achieving this peace of mind – providing key teams with detailed visibility into everything from the joist layout, routing options for services, and the remaining structural capacity.

Adopting a more flexible outlook to the right construction solutions is now central to long-term success. Open web steel joists represent a highly capable option for data center floors, equipped to manage modern loading requirements, accommodate future changes, and in some cases offer scheduling advantages.

Recognizing that potential rather than defaulting to beams may unlock stronger foundations for the next generation of data centers. ■

Contact Dennis Montgomery to learn more about how steel joists can provide the support your projects need: 260.321.8111 || dennis.montgomery@newmill.com

Building the best: What hyperscalers teach us about safety, sustainability, and infrastructure



Niklas Lindqvist,
ONNEC

Seizing the data center investment opportunity

With growth and productivity high on the political agenda worldwide, international interest in AI has exploded. Hyperscalers have traditionally led the way in data center development, and there are plenty of lessons to be learned to help other operators take advantage of growing opportunities that are being held back by resource constraints.

However, by learning from the innovators, operators can make strategic changes to meet the accelerating demand for data centers and seize this investment opportunity.

A blueprint for greener data centers

Operators are under pressure from governments and regulators to measure and report on sustainability and ESG. Regulations, such as the Corporate Sustainability Reporting Directive (CSRD), obligate organizations to share granular sustainability information. Total transparency on ESG and evidence-based reporting is becoming a must-have in data center sites.

By learning from hyperscalers, operators can achieve meaningful progress on ESG goals and avoid costly fines. Hyperscalers integrate sustainability early in the design phase, identifying ways to reduce waste and emissions by selecting energy-efficient materials and prioritizing local manufacturing and resources.

Teams will pre-configure equipment and cabling before deployment, minimizing on-site packaging waste and ensuring materials are easy to recycle or reuse. By coordinating material deliveries precisely to the right location at the right time with minimal waste, hyperscalers significantly lower the carbon footprint associated with logistics and installation.

Operators can explore innovative reuse of waste materials and energy in creative, community-focused ways. Some data centers channel waste heat to warm homes, offices, or greenhouses, maximizing resource efficiency by "using power twice."

A holistic approach to energy resourcing from the planning phase is crucial. Strategic integration of natural and renewable energy sources ensures both sustainability and

> "Hyperscalers have traditionally led the way in data center development, and there are plenty of lessons to be learned to help other operators take advantage of growing opportunities that are being held back by resource constraints."
>
> **Niklas Lindqvist,**
> ONNEC

reliability, offering a replicable model for smaller operators in their own site planning.

A choreographed approach to safety

Data centers present a unique set of health and safety hazards. These high-tech, high-risk environments require operators to mitigate dangers such as noise exposure, heat stress, electrical safety, and heavy lifting.

By embracing a holistic view of risks and prioritizing coordination, operators can significantly reduce accidents while ensuring smooth project progression. As demand for data centers grows, regulations will tighten. Companies that adopt hyperscaler-led health and safety practices will be better positioned to meet future compliance standards and avoid accidents and costly delays.

Operators should establish long-term solutions for storing materials and implement strict on-site cleanliness rules to maintain well-organized, obstruction-free areas. Dedicated storage zones outside operational areas can be beneficial, along with structured cable management systems to minimize loose wires. Implementing hot aisle/cold aisle configurations ensures clear cooling pathways and improves energy efficiency.

A choreographed approach, where each team understands its role and responsibilities, ensures that all potential hazards are systematically addressed. When safety becomes an integral part of daily operations, project timelines and budgets benefit as well.

The backbone of future-proofed data centers

High-quality cabling is the foundation of data center connectivity. Get it wrong, and facilities won't be able to support bandwidth needs for any longer than a few years, forcing costly rip-and-replace projects. Since data center budgets are often stretched by unexpected costs, cabling may suffer from inadequate investment.

Hyperscalers mitigate this risk by adhering to detailed cabling standards for every data center build. These comprehensive, granular documents cover cabling standards on everything from cabinets and containment to testing and earthing. Because data centers are usually built on a "just-in-time" delivery model, meticulous planning is required to get things right the first time and avoid delays. Early and detailed engagement with third-party experts in security, operations, power, cooling, and more is critical to ensuring that cabling infrastructure is fully integrated and free from bottlenecks.

Hyperscalers also maintain detailed databases of OEM guides, 3D models, 2D drawings, rack layouts, labelling, and cut sheets to assist with patching and future retrofits. These cut sheets create a "digital footprint" documenting cabling masterplans, tracking connectivity, and ensuring seamless hardware refreshes and site updates.

Cabling is viewed by hyperscalers as vital to futureproofing, enabling modular infrastructure that allows seamless hardware upgrades to cater for future workloads. By following this model, smaller operators can ensure long-term connectivity and scalability.

To BIM or not to BIM

Building Information Modelling (BIM) has become an essential tool for early decision-making, seamless collaboration, and smarter resource planning. In a high-pressure, AI-driven construction landscape, BIM

> "A choreographed approach, where each team understands its role and responsibilities, ensures that all potential hazards are systematically addressed. When safety becomes an integral part of daily operations, project timelines and budgets benefit as well."
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> **Niklas Lindqvist,**
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helps operators minimize costly delays, reduce errors, and futureproof their facilities.

BIM brings all stakeholders into one unified 3D model from the outset, creating a digital twin that accounts for every detail. This digital twin incorporates architecture, mechanical systems, electrical layouts, and cabling into a single, interactive model. The result? Reduced rework, fewer unexpected challenges, and streamlined project timelines.

With a detailed model in place, teams can anticipate when skilled workers are needed, preventing costly downtime. BIM also aids in procurement planning by identifying long-lead items in advance, reducing the risk of last-minute surprises – such as realizing critical cables are missing only after construction begins.

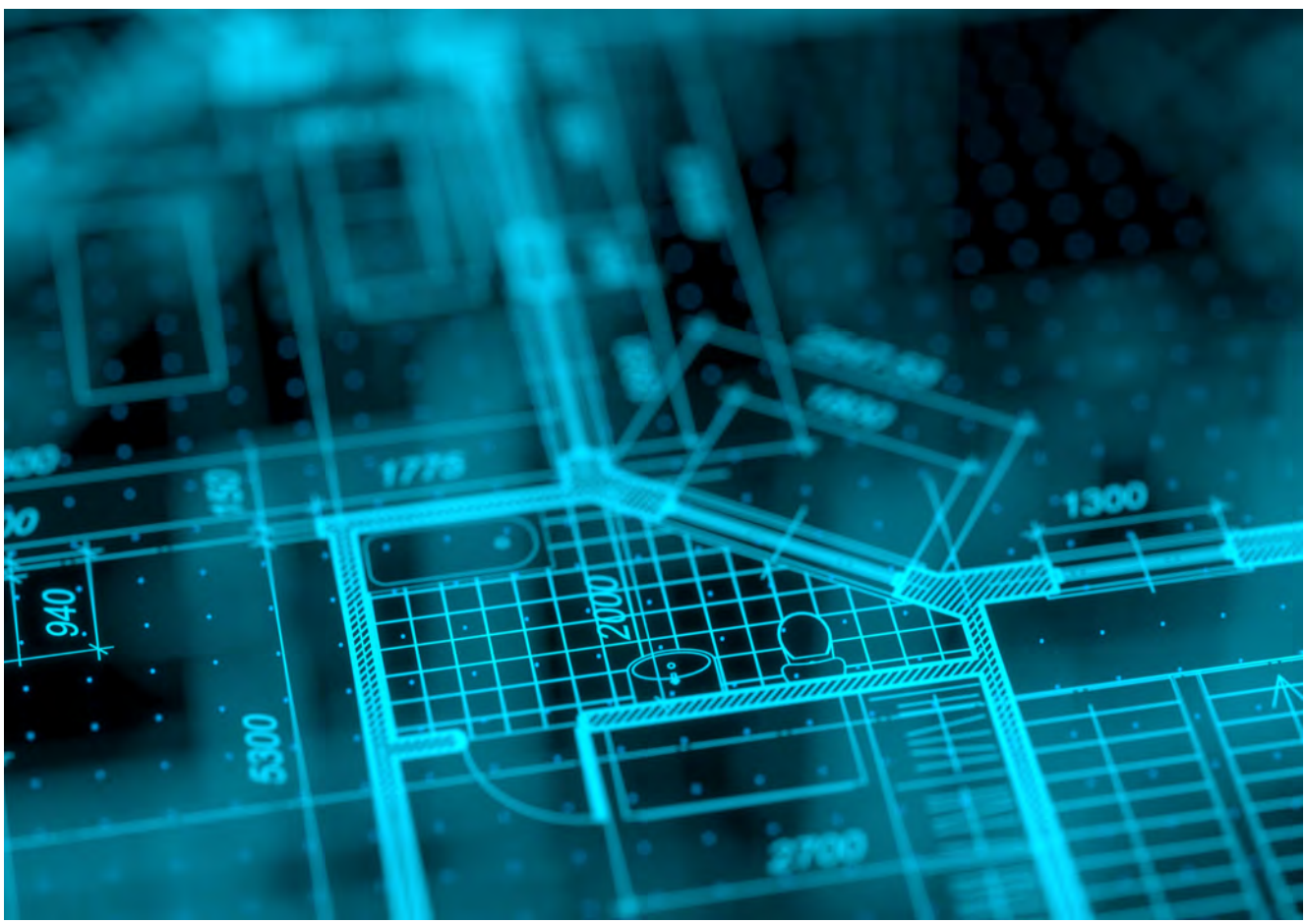
> "In a high-pressure, AI-driven construction landscape, BIM helps operators minimize costly delays, reduce errors, and futureproof their facilities."
>
> **Niklas Lindqvist,**
> ONNEC

Beyond construction, BIM remains a valuable asset. Once a data center is operational, the model functions as a living document, aiding day-to-day operations, retrofits, and upgrades. When new technologies emerge, BIM's scalable design enables facilities to expand or adapt with minimal disruption.

Adopting the hyperscaler playbook

As AI demand surges and data center infrastructure grows in importance, smaller operators must adapt or risk falling behind. By following the blueprint set by Hyperscalers – prioritizing sustainability, safety, robust cabling infrastructure, and BIM – operators can seize the opportunity to thrive in this new era.

Embracing these principles will ensure data centers are built for longevity, efficiency, and adaptability, supporting AI's future while meeting regulatory and sustainability demands. In this evolving landscape, those who invest in strategic innovation today will be the data center leaders of tomorrow. ■



Four keys to data center success

For hyperscale projects, the right partner supports you from concept to construction

There's no question artificial intelligence (AI) is the main attraction of next generation technology. Naturally, AI is also the primary driver of data center demand. Add in cloud computing, telecommunications, security, and other vital aspects of IT infrastructure and, clearly, data centers are only becoming more essential across industries.

"New Millennium recognizes data centers are crucial to business success," says Sean Smith, market development manager, data centers, at New Millennium. "For more than a decade we've worked to be an invaluable steel supply partner on data center construction projects. We've applied our expertise in steel joists and deck on every project, and we have gained a deeper understanding of the market's unique intricacies. That's made us a better partner from concept to construction."

For large-scale data center owners, developers, and builders – also known as hyperscalers – New Millennium delivers four keys to data center success: a dedicated team, speed to market, design flexibility, and sustainability.

It's a framework Smith says, that begins with the guidance of a dedicated team and depends on project involvement from the outset. As leader of the data center team, Smith's priority is to spark early conversations with large-scale owners and developers as well as designers, general contractors, structural engineers, and steel fabricators. Ideally, these conversations become collaborations.

Depend on a dedicated data center team

Traditionally, steel suppliers have been relegated to the backend of a data center build. Partnering at the start, however, allows New Millennium's specialists to make more immediate product recommendations intended to prevent delays or impacts to cost. A team that grasps the full scope of a project in advance can more quickly identify challenges or opportunities from end to end.

"It's not just a matter of selecting the best steel deck profile for the project," says Smith. "We weigh numerous factors to get to the right profile choice. We also work closely with partners to consider value engineering, facilitate load changes, and manage requests for information (RFIs). We assist

> "Our team approach is all about efficiency. For steel joists and decks, we're making recommendations to cure pain points at every stage, and that's vital to ensuring structural integrity and meeting tight timelines. For the end user, speed to market is speed to revenue."
>
> **Dan Longstreth,**
> New Millennium

on installation, coordinate schedules, provide project updates, and more. We offer team coverage, with a single point of contact."

The hyperscale data center team at New Millennium includes in-house engineers, designers, project managers, and sales strategists. Collectively, they also contribute to the effort of making each data center future proof – integrating structural features that can accommodate technological updates and advances. Again, early involvement widens the tactical aperture.

Built for speed to the data center market

Globally, the data center market is projected to reach nearly $500 billion by 2029, therefore it's no surprise that early talks with large-scale owners often start with lead times rather than project scope and even total cost. Unlike new warehouses, which can sit dormant until filled by a tenant, data centers tend to be business ready on day one.

"Our team approach is all about efficiency," says Dan Longstreth, strategic account sales manager at New Millennium. "For steel joists and decks, we're making recommendations to cure pain points at every stage, and that's vital to ensuring structural integrity and meeting tight timelines. For the end user, speed to market is speed to revenue."

Longstreth previously ran the detailing department at a New Millennium plant. His engineering background and steel deck knowledge adds to the team's forward focus. For instance, since he also manages New Millennium's relationship

with one of the industry's largest steel fabricators, his collaborative project insight might lead to specification of prefabricated steel decking components, reducing on-site labor and installation time. Strong partnerships and the interplay of New Millennium's keys to success allow the team to consistently meet lead times.

Supported by data center design flexibility

Whether single-story, multi-story, or colocation, every data center project is driven by owner intentions. That means delivering on distinct performance requirements as well as time, cost, efficiency, add-on ability, and more. Case in point, multi-story construction requires careful consideration of total floor depth, loads, vibration and acoustic ratings, and overall aesthetics. New Millennium offers a range of long-span composite floor systems that address these requirements, but their data center team first seeks to understand the goals of the project before making recommendations.

"Our engineers grasp the scope and then explore the most economical design," says Jill

> "For a particular data center project, our engineers might suggest integrating some of our steel deck accessories so there's less cutting in the field. Then we'll work together on other opportunities to streamline, such as maximizing loads and staging deliveries to the site."
>
> **Jill Engerman,**
> New Millennium

Engerman, national accounts project manager at New Millennium. "For a particular data center project, they might suggest integrating some of our steel deck accessories so there's less cutting in the field. Then we'll work together on other opportunities to streamline, such as maximizing loads and staging deliveries to the site."

As a project manager, Engerman is a single point of contact from start to finish. She's currently managing close to a dozen data center projects and contends that expertise, cohesiveness, and resourceful flexibility sets their team apart. In a market where the equipment within a data center is continually being updated, Engerman believes New Millennium's ability to be an engaging upstream partner on hyperscale projects is more valuable than ever.

Backed by sustainability in your data center

Certainly, data centers are one of the most energy-intensive building types. According to the US Department of Energy, they consume 10 to 50 times the energy per floor space of a typical commercial office building. As a division of Steel Dynamics Inc. (SDI), New Millennium benefits from SDI steel produced by high-efficiency electric arc furnace (EAF) technology. US EAF mills generate a fraction of the carbon emissions produced and energy intensity required by blast furnace steelmaking. Additionally, New Millennium's steel joists contain over 70 percent recycled content and its steel deck contains over 45 percent recycled content.

"In recent years sustainability has been a top priority in the data center market," says Josh Bozzi, also a national accounts project manager for New Millennium. "Data centers are increasingly characterized in megawatts over square footage to capture a data center's power consumption, capacity, and associated costs. We look at all aspects of sustainability with the engineer of record and general contractor and utilize the steel products most environmentally suited to the project."

Bozzi also points to tools such as Environmental Product Declarations (EPDs), which report a variety of lifecycle impacts including Global Warming Potential (GWP). Finding ways to reduce weight is another way New Millennium works to reduce a steel structure's environmental impact. A great example is its distinct approach to flush-frame connections for steel joists, which offers a simplified specification that can mean up to 35 percent less steel weight while achieving vibration performance equivalent to wide-flange beams.

New Millennium is committed to being the right partner for large-scale data center projects. Early design collaboration activates its 4 keys to data center success. The company's dedicated team will guide the right choice of steel joists and deck, streamline design and installation to accelerate speed to market, and employ products and practices that meet environmental goals with future-proof standards. After all, it takes specialized skills and ongoing collaboration to help build the IT infrastructure of the future. ■

Securing built-in sustainability

Erika Chaffey,
DCD

Retrofitting eco-conscious solutions post-build will no longer fit the bill. What's required is a construction strategy built on sustainability from the outset

As the digital economy continues to accelerate, the physical footprint underpinning it is growing with equally relentless force. Modern, high-density data center campuses are expanding in size and volume across the globe, facilitating the development of next-gen tech – from AI workloads to cloud computing and enterprise applications. But as the data center ecosystem continues to scale, so too does scrutiny over its environmental impact.

Traditionally, sustainability conversations across the industry have focused on operational efficiency – scrutinizing renewable energy sourcing, advanced cooling systems, and power usage effectiveness (PUE). While these remain critical, as complexity and impact grow with the rapid spread of facilities, today's sustainability discourse demands a more holistic approach.

Right under the noses – and feet – of the industry sits a quieter but equally critical consideration for building genuinely environmentally conscious facilities: material choices.

Today, the materials used to construct data centers – and the carbon embedded within them before a single server is switched on – are becoming central to sustainability strategies. And in this evolving landscape, structural steel is emerging from the background as a foundational solution.

Sean Smith, market development manager at New Millennium, believes this shift represents a fundamental change in how modern data center projects are planned, designed, and delivered:

"Hyperscale developers are moving sustainability requirements upstream into structural specifications as corporate net zero commitments tighten and eco-conscious financing terms grow more demanding," he explains. "In this environment, every structural choice is a carbon choice."

The central sustainability challenge for the industry today is no longer simply reducing emissions – it's understanding where they originate.

Built-in carbon, ready-made challenges

Measurable, manageable, and visible: operational carbon, tied to energy consumption, has long dominated the environmental narrative. It can be optimized over time through efficiency improvements and renewable energy procurement, yet embodied carbon is a different story.

"Operational energy draws most of the attention," says Smith, "but the carbon baked

into a facility's structure is fixed at the point of procurement and cannot be offset or optimized away after the fact."

Embodied carbon is locked in at the point of construction, and this distinction is critical. Once a facility has been built, its structural emissions are effectively permanent, meaning no amount of innovation or optimization can reverse the effects. This reality is driving a new urgency around material selection – particularly for high-volume components such as structural steel.

As one of the most widely used materials in hyperscale construction, steel represents a significant opportunity for meaningful emissions reductions. Even incremental improvements in its carbon intensity can translate into substantial project-level gains.

"The structural steel frame is one of the highest volume materials on any hyperscale project," notes Smith. "That means even modest improvements in carbon intensity deliver large absolute reductions."

A circular advantage

At the heart of this shift is the idea that not all steel is created equal. Traditional blast furnace steelmaking relies heavily on raw materials such as iron ore and coal, resulting in high levels of greenhouse gas emissions. In contrast, electric arc furnace (EAF) technology uses recycled scrap metal as its primary input, dramatically reducing its environmental footprint.

Steel Dynamics, Inc. (SDI), New Millennium's parent company, has built its entire operation around this alternative model. With an average of 88 percent recycled content as input across its steel mills, SDI's EAF steel production generates roughly one third of the greenhouse gas emissions associated with conventional methods – delivering genuine positive impact.

> **"As renewable electricity use grows, the Scope 2 emissions embedded in our products decline automatically. That happens without any additional action required from the project team."**
>
> **Sean Smith,**
> New Millennium

"Embodied carbon in our products is addressed at the source before a single beam is rolled," explains Smith.

This approach is part of a broader circular manufacturing model that connects recycling, steel production, and fabrication into a closed-loop system. Scrap metal collected today becomes the structural framework of tomorrow's facilities.

Over a recent two-year period, this system processed more than 41 million tons of recycled ferrous scrap – diverting waste from landfill while reducing demand for energy-intensive raw production.

And the implications extend far beyond environmental metrics. For developers, it means access to a supply chain with built-in sustainability, rather than retrofitting to meet increasingly stringent targets against the clock.

Renewable momentum

While recycled content plays a crucial role, it's only part of the equation. The energy used in steel production also has a significant impact on its overall carbon profile. In response, SDI is investing in renewable and emission-free energy integration across its operations.

By 2025, the company had already achieved 11 percent renewable electricity usage across its steel mills – exceeding its initial 2025 target of 10 percent. It is now targeting 30 percent by 2030, supported by a major wind energy agreement that generates 1.1 million MWh annually.

"As renewable and emission-free electricity use grows, the Scope 2 emissions embedded in our products decline automatically," says Smith. "That happens without any additional action required from the project team."

This built-in progress represents a crucial strategic advantage. It effectively evens out the decarbonization burden by shifting some of the pressure up the design and deployment chain, and embedding sustainability into the foundational materials themselves rather than relying solely on operational strategies.

Data-driven sustainability

Despite its importance, embodied carbon has historically been overlooked in data center construction. Smith explains:

"For years, embodied carbon was invisible in sustainability reporting because disclosure

was voluntary and assessment tools were inconsistent. The focus defaulted to what could be metered and billed."

But this is changing thanks to industry frameworks such as Leadership in Energy and Environmental Design (LEED) and Building Research Establishment Environmental Assessment Methodology (BREEAM), alongside growing demand for Environmental Product Declarations (EPDs), which are delivering material-level emissions data to the procurement process to spotlight what previously fell under the radar, and ensure sustainability becomes an actionable non-negotiable.

"Environmental product declarations and third-party verified emissions data are becoming table stakes, not differentiators," adds Smith.

This shift is reshaping expectations across the supply chain. Developers, investors, and regulators are demanding credible, verifiable data that will hold up under scrutiny – particularly as sustainability reporting becomes more closely tied to financial performance and access to capital.

SDI's science-based greenhouse gas targets, aligned with the Paris Agreement temperature goal of 1.5°C (34.7°F), provide a level of assurance that's becoming increasingly essential against this backdrop. For New Millennium's customers, this translates into documentation that supports everything from regulatory compliance to investor ESG evaluations.

The financing factor

Sustainability has quickly shifted beyond an environmental consideration and into a financial one, too. The rise of sustainability-linked loans and bonds, plus ESG-driven investment criteria is fundamentally changing how data center projects are funded. Material choices now have direct implications for access to investment and the cost of financing.

"Verified sustainability credentials support LEED credit documentation, eco-conscious bond eligibility, and corporate ESG disclosures," explains Smith. "All of which have real commercial impact."

At the same time, hyperscale tenants are bringing their own sustainability commitments into the equation.

> **"Developers will increasingly favor supply chains with verified, science-based commitments over those with self-reported claims."**
>
> **Sean Smith,**
> New Millennium

With Scope 3 emissions – those associated with supply chains and leased assets – under the microscope, the embodied carbon of a facility is becoming a factor in leasing decisions.

This creates a powerful incentive for developers to prioritize low-carbon materials from the outset. And certification systems are evolving in parallel, placing greater emphasis on embodied carbon alongside operational efficiency.

Procurement teams are responding by requesting detailed material data earlier in the design process than ever before. "The conversation is happening sooner," adds Smith. "And with greater urgency."

Engineering opportunity

With this complex web of challenges comes an equal number of opportunities. Steel offers unique advantages in the transition toward more sustainable construction. Its strength, durability, and recyclability make it inherently suited to circular economy principles – but continued innovation is key.

"The most impactful near-term gains will come from continuing to decarbonize the manufacturing process itself," says Smith. "Expanding renewable and emission-free electricity use, improving EAF efficiency, and advancing scrap sorting technology."

These efforts are already delivering measurable results. Since 2022, SDI has reduced its greenhouse gas emissions intensity by 14 percent. This is a significant step toward its 2030 Global Steel Climate Council (GSCC) certified emissions intensity target of 0.80 metric tons of CO_2e per metric ton of hot rolled steel produced. Crucially, these improvements are not isolated – they can be felt across the product chain.

For data center developers, this means that specifying low-carbon steel today doesn't have to represent a one-time decision on the checklist, but a meaningful step into a continuously improving sustainability chain.

A new kind of partnership

As data-driven sustainability moves up the priority list, relationships across the construction ecosystem must evolve in response. The traditional transactional model – where materials are specified and delivered with limited collaboration – is fading in favor of a more integrated approach.

> "Every structural decision carries weight – not just in terms of performance, but in terms of carbon."
>
> **Sean Smith,**
> New Millennium

Smith sees a future where material producers act as strategic partners in the decarbonization process: "The relationship will shift from transactional to strategic and producers will function as emissions data partners."

This includes providing project-specific information on recycled content, EPD documentation, and extends to forward-looking carbon intensity projections that can be incorporated into lifecycle assessments. Such collaboration is essential as developers work to meet increasingly stringent targets and navigate a rapidly changing, high-stakes regulatory landscape.

"Developers will increasingly favor supply chains with verified, science-based commitments over those with self-reported claims," says Smith.

The big picture

As data centers continue to scale at breakneck speed, their environmental impact will rightly remain under close scrutiny. Simultaneously meeting the demands of an increasingly digital world while aligning with global environmental goals demands an integrated, holistic approach that considers not only how facilities operate, but how they're built.

Sustainable materials are quickly becoming a foundational element of responsible infrastructure development. And in many ways, they represent one of the most immediate opportunities for meaningful change.

Unlike operational systems, which may take years to optimize, material choices deliver instant measurable impact, setting the baseline for a facility's carbon footprint from day one, making them increasingly indispensable in the industry's continued growth trajectory.

As Smith concludes: "every structural decision carries weight – not just in terms of performance, but in terms of carbon." ■

For more on Steel Dynamics, Inc.'s commitment to decarbonization, you can visit https://www.steeldynamics.com/valuing-the-environment/. Please contact Sean Smith to request more information on New Millennium's structural steel solutions for your data center construction needs. 618-694-5610 || sean.smith@newmill.com

Q&A with New Millennium & Steel Dynamics, Inc

BioEdge: Showcasing sustainability with experts from New Millennium and Steel Dynamics, Inc (SDI)

Q. Sustainability claims are under increasing scrutiny. As a result, how is BioEdge helping to respond to evolving customer expectations?

Customers are asking for lower-embodied-carbon products and third-party verified data. BioEdge is built to meet that standard. It pairs Green-e® Energy certified RECs sourced through Steel Dynamics, Inc (SDI's) own RPPA (renewable power purchase agreement), Canyon Wind Energy Center, with renewable biocarbon produced at SDI Biocarbon Solutions in the EAF steelmaking process.

SDI's RECs generated at Canyon Wind Energy Center are CRS-listed and Green-e® certified; SDI Biocarbon Solutions is PEFC (Programme for Endorsement of Forest Certification) certified with Environmental Product Declarations (EPDs) being developed to provide third-party verified GWP data for customers requiring quantified documentation.

Q. There's a lot of discussion around 'green' or 'low-carbon' steel. What do you think separates meaningful progress beyond these buzzwords?

The distinction comes down to whether emissions reductions are verifiable and the result of decarbonization innovations and projects led by the steel producer, or only reductions achieved by purchasing environmental attributes on the open market.

"Those with Scope 3 reduction commitments need documented evidence of emissions reductions in their supply chains. Structural steel is among the highest-embodied-carbon inputs in a data center build – BioEdge provides a documented pathway to directly reduce that embodied carbon."

New Millennium

Meaningful progress means making impactful changes that create real reductions in the production process. BioEdge uses EAF steelmaking technology, which consumes roughly 75 percent less energy than blast furnace/basic oxygen furnace production based on global averages, utilizing renewable or nuclear energy, with fossil-free biocarbon replacing anthracite coal in the furnace. The emissions reduction is built into the production process itself.

Q. Many approaches focus on just one part of the emissions equation. How does BioEdge address both direct and indirect emissions in steel production, and why is this comprehensive approach important?

BioEdge targets Scope 2 emissions (the indirect emissions from purchased electricity) through high-quality bundled RECs from SDI's Canyon Wind Energy Center RPPA. It also goes further by not only addressing Scope 2 GHG emissions, but by simultaneously addressing Scope 1 emissions (the direct process emissions from the EAF itself).

The significant reduction of Scope 1 emissions is achieved by substituting fossil-based anthracite with renewable biocarbon from SDI Biocarbon Solutions. Customers purchasing BioEdge receive 100 percent of the Scope 1 GHG reduction benefit from that biocarbon substitution. Addressing both electricity (indirect) and process emissions (direct) together produces a more complete and meaningful documented reduction profile.

Q. How does taking a more holistic approach to emissions reduction change the way data center developers think about their supply chains?

Scope 3 supply chain emissions, including embodied carbon in structural steel, have been harder for data center developers to address because they depend on what suppliers do upstream. Those with Scope 3 reduction commitments need documented evidence of emissions reductions in their supply chains. Structural steel is among the highest-embodied-carbon inputs in a data center build – BioEdge provides a documented pathway to directly reduce that embodied carbon.

Developers can specify a product where the emissions reduction is inherent to the material and traceable through RECs and EPDs. For companies with science-based targets or net-zero commitments that include Scope 3, that's a supply chain reduction that stands on its own documentation, providing developers a traceable, validated, and immediate contribution toward their supply chain decarbonization goals.

Q. There's often skepticism around carbon offsets and credits. How does BioEdge demonstrate real, measurable emissions reductions without overreliance on offsets?

BioEdge does not rely on carbon offsets for its Scope 1 reduction claim. The reduction is achieved by physically replacing anthracite coal with renewable biocarbon in the EAF steelmaking process. Biocarbon is a 1:1 material substitution that has been successfully trialed and verified across multiple SDI facilities, with no significant equipment modifications required and no impact on steel chemistry or properties.

The Scope 2 reduction is achieved by allocating bundled RECs from SDI's RPPA, Canyon Wind Energy Center. Canyon Wind brings over 1TWh of new renewable electricity

"BioEdge uses EAF steelmaking technology, which consumes roughly 75 percent less energy than blast furnace/basic oxygen furnace production based on global averages, utilizing renewable or nuclear energy, with fossil-free biocarbon replacing anthracite coal in the furnace."

New Millennium

generation onto the grid. The documentation chain including SDI Biocarbon Solutions' PEFC-certification, SDI's CRS-listed and Green-e® certified RECs from Canyon Wind, and forthcoming EPDs, gives customers a clear record of how reductions are achieved from beginning to end.

Q. What does it mean in practice to move from accounting-based sustainability to physical changes in the production process?

With accounting-based sustainability, only certificates are purchased and paired with the product, however the steel itself is made exactly the same way it always was. With BioEdge, the inputs are different. Renewable, fossil-free biocarbon is actually utilized at the steel mill in the EAF, and the electricity powering the furnace is matched by bundled RECs from SDI's own investment in new renewable electricity generation (RPPA). The lower carbon footprint of the product is a result of what went into making it.

> "Demand is moving toward greater documentation and verification. Regulatory programs and emerging embodied carbon thresholds are establishing harder floors for what constitutes acceptable documentation."
>
> **New Millennium**

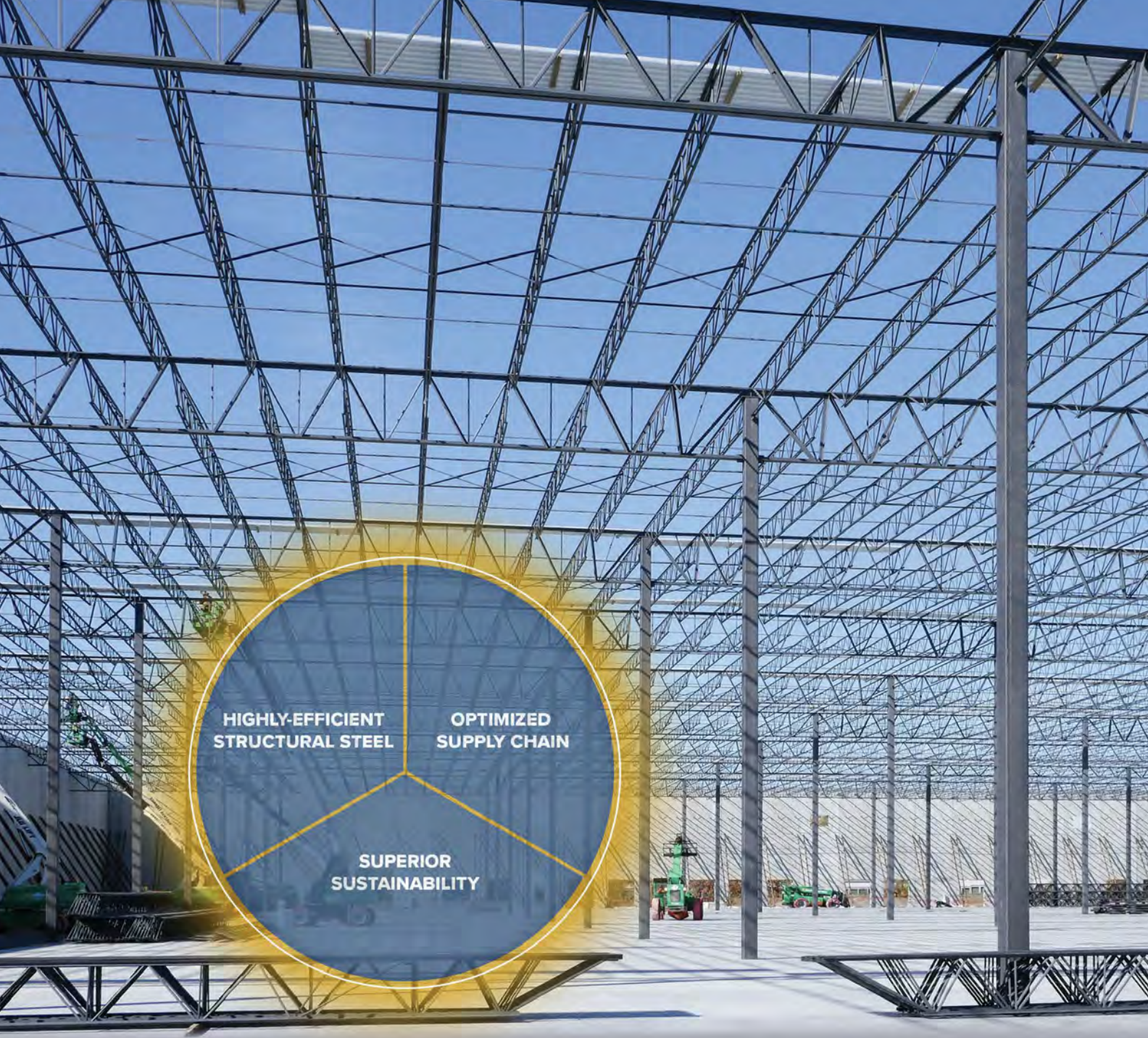
Q. How important is vertical integration, such as controlling both energy generation and raw material inputs, in delivering more credible sustainability outcomes?

SDI's ability to make credible BioEdge claims is directly tied to the degree of control it has over the inputs. Biocarbon is sourced exclusively from SDI Biocarbon Solutions, and renewable energy certificates are sourced through SDI's own RPPA with NextEra, the Canyon Wind Energy Center. That integration means the chain of custody is tight, auditable at every step, and the sustainability attributes are specific to SDI's actions and investment in new projects. For customers who value credible decarbonization, the traceability offered by this unique position of control, from the sustainable sourcing of biomass to a finished lower-embodied carbon steel product, carries significant weight.

Q. Looking ahead, how do you see demand evolving for solutions that can demonstrate both environmental integrity and tangible business value in one?

Demand is moving toward greater documentation and verification. Regulatory programs and emerging embodied carbon thresholds are establishing harder floors for what constitutes acceptable documentation. Corporate sustainability commitments are also subject to increasing scrutiny from investors, lenders, and auditors. BioEdge is positioned for that environment: EAF steelmaking, renewable energy certificated from SDI's own RPPA, and renewable biocarbon usage are durable, verifiable differentiators. As embodied carbon becomes a standard procurement consideration, having a documented low-carbon product becomes a practical business requirement. ■

Click here to find out more about SDI's BioEdge. And to talk to New Millennium about reducing the carbon emissions of your project, contact Sean Smith on 704.534.6221 || sean.smith@newmill.com



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Lower carbon impact.

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