The intelligence behind sustainability

Industrial AI's critical role in decarbonization

A collaboration between IFS and PwC UK

Executive Summary

Industrial decarbonization has entered its decisive decade. Global energy demand is still climbing and **the eight hard-to-abate sectors[1] account for 40% of total global greenhouse gas emissions[2]**. Every new furnace or turbine built today risks locking in emissions until mid-century. Yet, these same assets hold the key to faster progress if they can be operated and upgraded intelligently.

Across the world's factories, grids, and process plants, a quiet AI transformation is already underway. **Industrial AI**–the application of artificial intelligence technologies within industrial settings to automate, optimize and enhance complex operational processes–has already begun to cut both emissions and costs in real time. Beneath the surface of our day-to-day, this 'invisible revolution' is transforming the industrial world, impacting everything from the way our food is produced to the integration of renewable energy on our grid infrastructure.

IFS research, The Invisible Revolution (2025), shows this acceleration clearly. Surveying more than **1,700 senior executives from around the world** across multiple industries including manufacturing, energy, construction, and utilities, the study[3] found:

- **90% of US leaders** plan to increase AI investment in 2025.
- **86% believe AI** will help organizations meet environmental goals, from energy efficiency to carbon emission management.
- The share of **"AI-First" industrial enterprises** is expected to rise from 32% to 59% within 12 months.

Although the increasing adoption of Industrial AI comes with its own increase in energy demand, recent studies point to the potential of decarbonization gains to far outweigh this. Advancements in AI in power, transport and food production could reduce global emissions of greenhouse gases by 3.2 to 5.4 billion tonnes of carbon-dioxide-equivalent annually by 2035, according to new research by the Grantham Research Institute on Climate Change and the Environment and Systemiq[4]. AI has the potential to be an important catalyst for net-zero through its deployment in heavy-emitting sectors and supporting policy.

Early adopters are already seeing results. Benchmark data from IFS Planning, Scheduling, and Optimisation (PSO) deployments show an average 37.1% reduction in total travel distance, with results varying from 15 to 70% depending on operational context and maturity[5]. These efficiency gains reduce fuel use and operating costs while boosting productivity, demonstrating a clear commercial ROI alongside emissions reduction.

90%

of US leaders plan to increase AI investment in 2025

86%

believe AI will help organizations meet environmental goals, from energy efficiency to carbon emission management

1. Aviation, shipping, trucking, steel, cement, aluminum, primary chemicals and oil and gas
2. World Economic Forum, Emissions fall in hard-to-abate sectors but still off track to reach 2050 net-zero targets, 2024.
3. IFS, The Invisible Revolution: Industrial AI Driving Global Growth, 2025.
4. London School of Economics, New study finds AI could reduce global emissions annually by 3.2 to 5.4 billion tonnes of carbon dioxide equivalent by 2035, 2025.
5. IFS Field Service Data, IFS Planning, Scheduling and Optimisation (PSO) Results Summary, 2025.

For business leaders, investors, and regulators, trust is becoming the defining factor of progress. Industrial AI's ability to create **traceable, auditable data** across operations gives it a unique role in verifying sustainability results. PwC's Trust Based Transformation economic modeling suggests that, when responsible AI deployment and ambitious decarbonization is underpinned by high trust, AI-driven productivity gains have the potential to offset the cost of stranded assets and lead to net growth of approximately 37% by 2035 compared to today's economy[6].

This same intelligence that builds trust in reporting also drives tangible efficiency gains within operations. While Industrial AI does not solve the structural or process challenges that make heavy industries difficult to decarbonize, it can meaningfully reduce emissions by improving efficiency and resource use. Its near-term mission is optimization that tightens control, reduces waste and frees capital for clean technology investment. Its longer-term value is industry transformation. As AI becomes more autonomous, systems will coordinate energy demand, production and maintenance automatically, aligning industrial performance with grid carbon intensity and renewable availability. AI-centric models will support capital investment plans to include factors such as climate resilience, biodiversity and water scarcity, bolstering transition planning.

With trusted data, efficient compute and cross-functional collaboration, Industrial AI is emerging as the operating system for a resilient, low-carbon economy. The invisible revolution is underway, and the question is how quickly industry leaders can make it visible in their results.

This same intelligence that builds trust in reporting also drives tangible efficiency gains within operations.

6. PwC, A Leader's Guide to Value in Motion, 2024.

Introduction

Heavy and hard-to-abate industries represent both the foundation of modern economies and one of their greatest decarbonization challenges. They power growth but also drive a significant share of global emissions, forcing a fundamental rethink of how essential industries can operate sustainably without disrupting output or reliability. To meet climate goals, these sectors must reimagine how they operate without sacrificing reliability or competitiveness. As PwC's 'Will Net Zero AI Become a Reality' outlines, the growing role of AI in achieving global net-zero targets brings both opportunity and responsibility, balancing tech-driven decarbonization with new energy demands[7].

Decarbonizing these industries is uniquely complex due to the challenges of high energy intensity, process emissions that are difficult to eliminate and long-lived capital assets that lock in current practices. Much of the infrastructure that will operate in 2050 still relies on systems and assets designed decades ago. Optimization and retrofitting today offer the fastest route to meaningful emissions reductions. Yet, the path forward is constrained by thin margins and uncertainty and the low maturity of many low-carbon options. That is why leading manufacturers, utilities and energy companies are seeking smarter ways to operate within existing constraints, accelerating progress where possible. Many are turning to industrial AI, the emerging backbone of intelligent, low-carbon operations. These systems are continuously learning from data and fine-tuning performance in real time. They help stabilize production, anticipate maintenance needs, and optimize power use with renewable energy availability.

Each improvement may seem small, but together they add up to meaningful change. According to the World Economic Forum, the most significant short-term opportunity to reduce energy consumption and avoid emissions is to invest in energy efficiency.

7. Utility Week, Decision Analytics for Net Zero and ESG, 2021.

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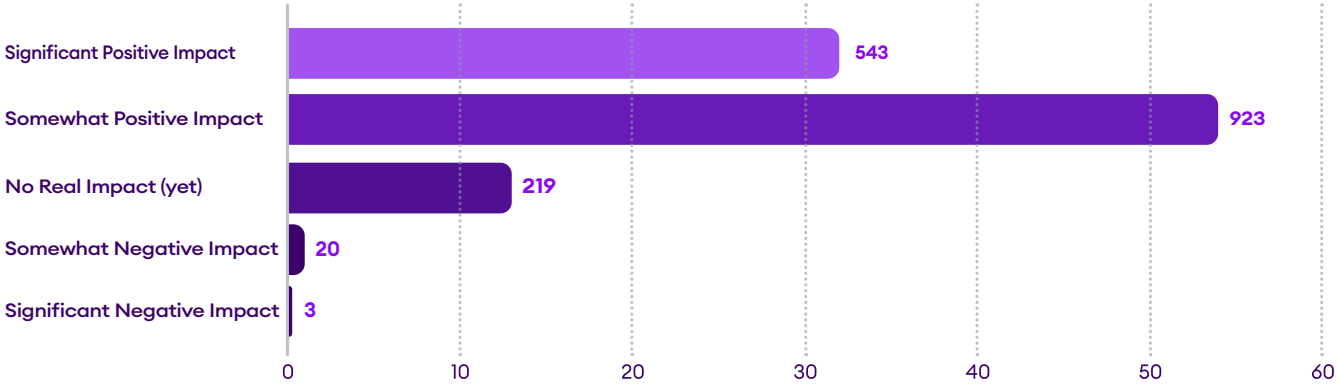
Efficiency delivers immediate and dependable reductions by using existing assets and processes more intelligently. It lowers operating costs, strengthens resilience against energy volatility, and supports faster progress toward net zero. For heavy industries, pairing efficiency with digitalization multiplies impact, each optimization, even small in scale, compounds across networks and assets to deliver meaningful emissions reductions.

A more efficient heat rate, a well-timed maintenance intervention and hundreds of micro-adjustments made daily, compound into measurable reductions in energy use and emissions. What's more, the opportunity is immediate. Organizations are deploying Industrial AI where it delivers quick wins, then scaling proven solutions to accelerate impact. This approach enables companies to reduce emissions now, while also boosting margins and building competitiveness at speed.

Industrial AI not only improves performance but builds trust in results. The same data streams that optimize operations can provide verifiable evidence for reporting. This ability to connect improvement with proof makes AI both a performance driver and an assurance enabler, addressing the growing need for measurable, auditable decarbonization.

How much is AI currently contributing to your organization optimizing its supply chain's sustainability?



Source: IFS "The Invisible Revolution", 2025

Industrial AI for Heavy Industries

Industrial AI is redefining how core operations run in the world's most complex sectors. For decades, industries have relied on automation, process control, and optimization software. What has changed is the fusion of these systems with real-time data, scalable compute and machine learning. Together, they form a self-learning layer across plants, grids and fleets that continuously fine-tune performance.

The timing is critical. Heavy industry faces structural constraints that slow decarbonization: long-lived capital assets, thin margins, high heat requirements, and the technical difficulty of switching to alternative fuels. **The PwC paper,** Derisking the Energy Transition in Europe, notes that **56% of decarbonization** will need to be delivered by technologies that are not yet commercially mature[8]. While these solutions continue to be developed, **Industrial AI enables industries to make progress against decarbonization targets** by improving efficiency, optimizing existing systems, and reducing emissions from assets already in service.

Three converging forces are driving Industrial AI adoption:

1. **Data maturity.** Industrial organizations often struggle with data dispersed across operational, maintenance, and enterprise systems. Integrating these platforms to create consistent, high-quality information provides the foundation for AI to generate reliable insights and guide better decisions.
2. **Compute accessibility:** Industrial AI relies on the ability to process vast amounts of operational data quickly and securely. The growing accessibility of cloud and edge infrastructure allows companies to run advanced AI workloads close to where data is created–in production lines, assets, and service operations. This hybrid approach ensures real-time performance while maintaining control over sensitive industrial data, making it practical for heavy industries that operate across multiple sites and geographies.
3. **Commitment to decarbonization—** Businesses remain committed to decarbonization, with 84% of companies standing by their climate commitments[9]. Regulatory pressure and the pursuit of long-term sustainable growth are driving action whilst acknowledging that progress is dependent on technology and value chain collaboration.

According to **IFS's Invisible Revolution study**, almost **60% of industrial organizations** expect to operate as "AI First" within a year, nearly double current levels, and **90% of U.S. leaders** plan to increase AI investment in 2025 compared to 2024[3]. These figures indicate that AI adoption within industrial enterprises is scaling rapidly, with many moving beyond pilot projects toward operational use.

Industrial AI does not just follow programmed rules; it learns. It detects drift in process variables, adjusts control parameters, and keeps optimization continuous. These small, invisible corrections add up to measurable progress. In this sense, sustainability becomes part of the operating system itself, not a separate initiative.

Industrial AI also transforms traceability and assurance. Every decision, data point, and model iteration can be captured with provenance. For industries under increasing scrutiny, this means sustainability reports can be backed by verifiable operational evidence rather than estimates.

3. IFS, The Invisible Revolution: Industrial AI Driving Global Growth, 2025.
8. PwC, Derisking the Energy Transition in Europe, 2025.
9. PwC, State of Decarbonisation Report, 2025

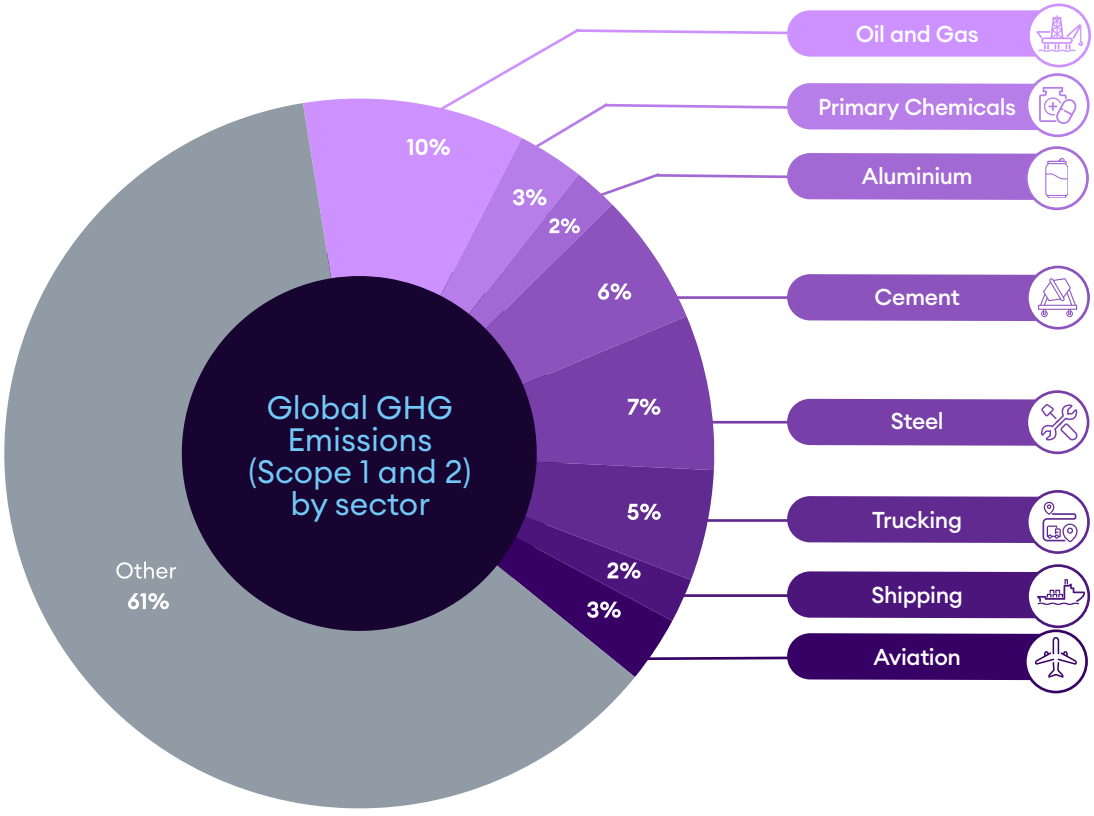
The Broad Challenge of Decarbonization

Decarbonizing heavy industry is a complex, global challenge. In steel, cement, and chemicals, process emissions are a large contributor to the total industrial CO_2 output. Most of these emissions are hard-to-abate because they come directly from chemical reactions or thermal processes that cannot be easily electrified. At the same time, heavy industries operate on tight margins and capital cycles that often stretch across 30 to 50 years. Once new plants are built, their emissions are effectively locked in for decades.

Data fragmentation adds to the challenge. Key information is spread across enterprise resource planning (ERP) systems, manufacturing execution systems (MES), data historian systems and field sensors, often in incompatible formats. Without consistent, validated data, organizations struggle to calculate baselines, track progress, or build a credible narrative for investors and regulators.

Companies face rising expectations to decarbonize faster, prove resilience to climate risk, and report transparently on progress. Driven by evolving regulatory frameworks and increasing pressure from stakeholders, from customers aiming to decarbonize their value chains to investors demanding transparency on Scope 3 emissions, industrial operators are now required to provide measurable evidence of emissions reductions. However, for many, the burden of data collection and disclosure is growing more rapidly than the actual pace of emissions cuts.

Industries are under more pressure than ever to decarbonize but the tools they rely on for management were not built for it, creating structural tension. Closing this gap requires a new approach that makes efficiency, emissions tracking, and assurance part of the same operating system. **Industrial AI** delivers this capability.



Source: IEA and IAI. via World Economic Forum: Net-Zero Industry Tracker 2024 Edition

The Potential of Industrial AI to Support Decarbonization

Industrial AI gives heavy industry a way to move faster within existing constraints. Instead of waiting for breakthrough technologies like hydrogen or large-scale carbon capture, companies can use intelligent optimization to accelerate emissions reductions now.

Industrial AI learns continuously from sensors, control loops, and operational logs to detect inefficiencies that human teams may overlook. While not the sole solution to decarbonization, when applied well, industrial AI can function as an optimization layer, supporting decarbonization levers to work smarter and harder. Industrial AI can, for example, help coordinate boilers, turbines, and compressors using demand and weather forecasts. It can help read vibration and power signatures on pumps and fans to plan maintenance and it can stabilize complex processes, synchronize energy consumption with renewable availability, and guide maintenance or capital decisions based on predictive insights.

Industrial AI supports the rollout of emerging technologies too. **Digital twins** enable operators to simulate the impact of new fuels, energy storage, or carbon capture on plant performance before investment. In power generation, AI aligns production with renewable supply, maximizing low-carbon input without compromising reliability.

Industrial AI does not replace engineering progress; but accelerates it. It transforms operational data into actionable intelligence, empowering the industry to cut emissions and lay the foundation for the next generation of clean technologies.

What Industrial AI Changes

By learning from operational data, AI helps companies to use resources more efficiently, reduce waste, and connect decisions with measurable sustainability outcomes. It can have a transformative impact across multiple applications.

1. Asset Investment and Infrastructure Planning

Capital-intensive industries face complex investment decisions that require balancing cost, reliability and sustainability.

Investment planning is often hindered by short-term budgeting cycles, limited funding, and fluctuating commodity prices, challenges that are especially pronounced in the energy and utilities sector. AI-enabled asset investment planning helps address these barriers by enhancing investment decision-making, optimising portfolios, modelling asset risk, and predicting asset performance.

Endeavour Energy

AI-supported investment for sustainability

Endeavour Energy operates a **6.7 billion AUD** electricity distribution network in Australia. The company implemented an AI-supported planning framework to evaluate asset reliability, safety and environmental performance alongside cost. This approach quantifies how investment decisions influence emissions, reliability and customer outcomes, providing measurable evidence for regulators and investors.

> “We assessed and incorporated factors that were not on our radar before and translated these into value for our customers. AI has helped us understand and quantify the impact of our operations on the environment as well as the impact of downtime on our customers.”
>
> **Endeavour Energy**

2. Manufacturing, Scheduling, and Process Optimization

Industrial AI enhances how manufacturing and process industries plan and control production. By analyzing data from demand forecasts, equipment sensors and energy markets, AI models determine how to run operations with less waste and lower carbon intensity.

50%

improvement in production from AI, while reducing material waste and energy consumption

Suzuki Garphyttan

AI-driven planning and scheduling

Spring-wire manufacturer Suzuki Garphyttan is rolling out AI-based modules for demand planning and manufacturing scheduling across six countries. The company aims to achieve up to a **50% improvement in production** while reducing material waste and energy consumption[9].

Research indicates that carbon-aware scheduling–aligning production with periods of lower grid carbon intensity–can support reductions in Scope 2 emissions by **up to 47.6%**[10].

Through these targeted improvements, AI scheduling and optimization deliver immediate operational savings and support long-term decarbonization.

9. IFS, Suzuki Garphyttan Case Study: AI-Driven Demand Planning and MSO Simulation, 2025.
10. Mencaroni, G. et al., Towards Net-Zero Manufacturing: Carbon-Aware Scheduling for GHG Emissions Reduction, 2025.

3. Predictive Maintenance and Reliability

Predictive maintenance is one of the most mature and measurable applications of Industrial AI. It enables companies to shift from reactive or time-based maintenance schedules to **condition-based monitoring**. Machine learning algorithms analyze vibration, temperature, and energy-use patterns to identify anomalies and predict failures before they occur.

Predictive maintenance also improves safety by preventing emergency repairs and reducing manual inspections in hazardous environments. It supports circular manufacturing principles by maximizing asset life and reducing the embodied carbon of replacement parts.

Germany's E.ON, as part of a broader AI program to speed up operations, built a machine learning model that predicts distribution-grid equipment failures. It forecasts when medium-voltage cables need replacing and has cut outages by 30%[11].

Every intervention and outcome is logged as traceable data, creating a verified link between maintenance, performance and emissions reduction. Predictive maintenance remains one of the clearest demonstrations of **Industrial AI** in daily operations.

30%

reduction in outages from predictive maintenance

11. Hy-Ram, AI in the Utilities Sector, 2025.

4. Field Service and Logistics Optimization

Field service and logistics are often overlooked when discussing industrial sustainability, yet they represent a major and immediate opportunity for decarbonization. Fleet travel, spare-part logistics and workforce scheduling account for a significant share of Scope 3 emissions across asset-heavy industries. Optimizing these activities with Industrial AI delivers measurable gains in both efficiency and carbon performance.

AI-powered Planning, Scheduling, and Optimization (PSO) systems analyze real-time data on service demand, location, technician skills, spare parts and traffic conditions. They continuously rebalance resources to minimize travel distance, increase productivity and reduce idle time.

Konica Minolta

Dynamic scheduling reduces travel and emissions

Konica Minolta introduced AI-driven PSO across five national operating companies, supporting 430,000 customers. Within 18 months, the company achieved:

- **25% higher field productivity.**
- **11.1 % reduction in total average time saved travelling and completing each job.**
- **4.36× return on investment.**

Each route and optimization creates traceable data that can be used in verified emissions reporting. Field service is one of the simplest areas to quantify AI's sustainability impact.

The Konica Minolta results reflect the wider trends from the IFS Scheduling Optimization benchmark, which shows **average travel-distance reductions of 37% and travel-time reductions of 33%** across implementations. While Konica Minolta achieved strong improvements, **many benchmarked organisations reported even greater travel-time savings**, demonstrating how AI-driven scheduling can scale efficiently across different operational models and maturity levels.

> "Factoring in the savings from less travel time, faster job resolution and lower fuel use, we've seen an ROI of 4.36× since adopting AI scheduling."

Ged Cranny, Senior Consultant, Konica Minolta BEU Service and Support[12]

12. IFS, Konica Minolta Customer Story, 2025.

5. Integration of Low-Carbon Technologies

AI-driven simulation and digital twin technologies accelerate the integration of **low-carbon innovations** such as hydrogen, electrified heat, carbon capture and industrial site microgrids. Before investing, operators can model performance and risk across different configurations to identify optimal pathways.

Once deployed, AI systems monitor operations in real time, adjusting control parameters to maintain efficiency.

Embedding AI at the core of new technology adoption ensures that decarbonization progress is data-driven, efficient and continuous. However, sectors like heavy industry, have **disproportionately high emissions compared to their level of funding**, receiving far less global climate-related venture funding than the energy and mobility sectors (70-80%) where the transition is well underway[13].

Financing mechanisms such as green tax credits are emerging as powerful levers to unlock private investment in sustainable technologies; de-risking early-stage innovation and accelerating the deployment of AI-enabled decarbonization solutions at scale.

6. Building Assurance into Operations

Industrial AI improves the **integrity and traceability** of sustainability data. Each data point, model, and decision can be versioned, creating a transparent digital record of operational change.

This strengthens confidence among regulators, auditors and investors. AI models can automatically recalculate emissions factors, adjust forecasts, generate evidence packs and support verification. This reduces time spent on manual reporting, improves transparency, and reduces time spent by sustainability functions on process-heavy reporting, allowing them to focus on forward-looking strategy and real impact.

The outcome is a closed loop between operations and assurance where sustainability performance is measurable and trusted in real time, and decisions can be made quicker.

13. PwC, State of Climate Tech 2024.

Risks and Trade-Offs— Scoping the Challenge

Industrial AI has a role to play in supporting companies to deliver measurable emissions reductions, but it also introduces new dependencies on data and compute. The challenge is ensuring that the emissions avoided through AI outweigh those created by the systems that power it.

Beyond environmental concerns, the reliability of decisions and actions produced by Industrial AI also hinges on data quality and trust. Adoption also slows when frontline teams lack trust in reliability, or the skills to apply AI in daily work.

1. The Energy Footprint of AI

The IEA estimates that global data-center electricity equates to about 1.5% of global consumption in 2024 and is projected to reach approximately **945TWh by 2035** in its base rate scenario, roughly equivalent to Japan's total grid use today[14]. Goldman Sachs forecasts that AI-related workloads, a key driver of increasing demand, will boost data center power demand **50% by 2027** and **165% by 2030**[15].

In a 2024 article, the World Economic Forum highlighted that the AI lifecycle impacts the environment in two key stages: training and inference, accounting for 20% and 80% of its environmental footprint, respectively[16]. In practice, embedding AI in industrial processes creates a continuous energy draw to keep models operating. According to the IEA, "A typical AI-focused data center consumes as much electricity as 100,000 households."[14]. At the same time, AI's water usage for cooling is on the rise.

It's important to recognize, however, that this demand is starting from a relatively low baseline compared to some other sectors and the use of renewable energy to power AI is also increasing. PwC's global analysis, 'Will Net Zero AI Become a Reality' highlights that while AI's energy use is expected to increase, proactive strategies around green infrastructure, renewable integration, and responsible AI deployment could align the growth of AI with global net-zero ambitions[7].

About 27% of data center electricity now comes from renewable sources. Efficiency measures such as carbon-aware scheduling, which shifts workloads to times when renewable energy is abundant, and edge computing, which runs AI inference closer to end users, reducing data transmission and reliance on energy-intensive processors, are further reducing the net environmental impact[14].

In line with this, Microsoft is now building data centers with green steel, which has up to 95% lower emissions than traditional steel, through its new partnership with Stegra[17].

Hyperscalers can also accelerate investment in the green economy and innovation, from renewable energy to power data centers through to backing innovative production of green steel for construction. Without renewable sourcing, efficiency improvements and the adoption of strong governance over data drift, lineage, and validation, the rising energy use of Industrial AI can erode the very gains it is meant to deliver.

Moving forwards, the level of uncertainty regarding AI's future energy and water use is high, driven by a dynamic interplay between significant efficiency gains (like those seen in the DeepSeek models) and a simultaneous, potentially offsetting, surge in demand from widespread adoption and agentic AI.

7. PwC, Will Net Zero AI Become a Reality, 2025
14. IEA, Energy and AI, 2025.
15. Goldman Sachs, AI to Drive 165% Increase in Data Center Power Demand by 2030, 2025.
16. World Economic Forum, How to Manage AI's Energy Demand: Today, Tomorrow and in the Future, 2024.
17. Stegra, Agreement with Microsoft Announced, 2025.

2. Data Quality, Security and Governance

AI relies on trustworthy data. Without strong governance, poor quality or unmonitored drift can lead to unreliable results, widely known as 'garbage in, garbage out.'

Cyber risk is also a growing issue. The World Economic Forum's Global Risks Report (2025) lists cyber espionage and warfare among the **top five global risks over the next two years**[18]. Industrial AI systems must be safeguarded against cyber threats and data manipulation, with embedded fail-safes, redundancy and robust validation to ensure safe recovery and continuity under stress.

Robust governance frameworks with clear ownership, validation, and testing routines help ensure integrity. Treating AI models as production assets with defined accountability embeds responsibility into daily operations.

For example, AI can play a key role in maintaining data integrity and governance across complex operations. AI can automatically detect data anomalies, ensuring decisions are based on accurate, trustworthy information. These same systems can monitor cybersecurity threats and enforce compliance with safety and emissions standards, creating a robust layer of digital oversight.

3. Workforce Transition and Trust

Industrial AI reshapes the workforce, and change management is at the top of every CIO's list. Routine planning, predictive maintenance, and fault detection tasks are increasingly being automated by AI. In energy specifically, demand for augmentable roles has grown 93% between 2019 and 2024[19]. IFS research shows that **99% of organizations** will need retraining or reskilling to fully implement AI, with more than half estimating that **up to 60% of staff** will need retraining[3].

Engaging employees early and providing transparent insights into how AI makes recommendations builds trust and accelerates adoption. Human oversight remains critical for operational safety and credibility.

3. IFS, The Invisible Revolution: Industrial AI Driving Global Growth, 2025.
18. World Economic Forum, Global Risks Report, 2025.
19. PwC, AI Jobs Barometer–Industry Insights, 2025.

Enablers for Scale

Scaling Industrial AI requires the right mix of **data, infrastructure, skills and trust**. Most companies have proof points in place but still struggle to replicate them consistently.

IFS research shows that **86% of industrial leaders** see AI as essential for meeting sustainability goals[3] but data quality, culture, and governance remain the biggest barriers

1. Data You Can Trust

Industrial AI is reliant on high-quality data. Industrial companies collect vast amounts of data, but to effectively adopt and utilize Industrial AI, companies will need to define a single trusted source of operational and sustainability data to achieve fast progress. The focus should be on improving quality rather than quantity. Documented data lineage keeps transformations traceable end to end, while continuous monitoring for quality and drift supports timely correction.

2. Digital Foundations That Scale

AI performance depends on solid digital infrastructure. Many organizations still rely on outdated networks that limit reliability. The basics matter: enough capacity in the right places, reliable links between plants and central systems and a clear view of cost, carbon and service levels. A practical approach combines edge computing for local inference with cloud platforms for global coordination. This balance ensures resilience, reduces latency, and optimizes energy use.

3. People Who Shape the Change

AI changes how work gets done. It automates some tasks while creating new ones in data analysis and decision oversight. However, for AI to scale, employees must evolve alongside it. PwC's 2025 Global AI Jobs Barometer reveals that skills sought by employers for AI-exposed jobs are changing 66% faster than for non-AI exposed jobs[20]. According to IFS research, 53% of senior decision makers estimate up to 60% of their workforce will need retraining, while a third say it could be as high as 100%[3]. The fastest adopters involve frontline staff early, building confidence, and improving accuracy through participation.

4. Clear Rules and Responsible Use

Formal oversight is essential. 62% of global senior decision makers polled in the IFS survey believe AI requires some form of regulation[3]. Good governance ensures reliability, transparency and accountability and will support organizations to scale AI responsibly.

5. Collaboration That Accelerates Progress

No company can transform in isolation. Scaling industrial AI in heavy industries depends on robust collaboration between industry players, policy makers, technology providers and assurance partners. In collaboration, organizations can better drive industry-wide decarbonization and sustained operational benefit whilst navigating the uncertainty creating by evolving regulations.

3. IFS, The Invisible Revolution: Industrial AI Driving Global Growth, 2025.
20. PwC, AI Jobs Barometer: United Kingdom Analysis, 2025.

Looking to the Future

Industrial AI is becoming part of the operational fabric of heavy industry. Factories, utilities and production networks now use AI to connect maintenance, logistics and planning into one intelligent system.

The next wave will focus on adaptability and autonomy. According to IFS research, **35% of industrial organizations** are already experimenting with **agent-based AI** that can plan and act within defined safety boundaries[3].

The WEF estimates that scaling digital technologies could result in a 20% reduction in emissions by 2050 in the three highest-emitting sectors; energy, materials and mobility[21]. Realizing this progress will be dependent on organizations having the right foundations to embed such technologies, including Industrial AI, as the norm.

35%

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20%

reduction in emissions by 2050 in the three highest-emitting sectors; energy, materials and mobility

3. IFS, The Invisible Revolution: Industrial AI Driving Global Growth, 2025.
21. World Economic Forum, How Digital Solutions Can Reduce Global Emissions, 2022.

The Time for Action Is Now

Heavy industries face rising pressure to cut emissions while maintaining competitiveness. Energy prices are volatile; supply chains are exposed and reporting obligations are expanding. Waiting for perfect solutions will only delay progress.

Industrial AI provides a practical path forward, intersecting commercial value with sustainability in three key ways:

- Enabling industrial organizations to 'do more with less' driving efficiencies through their operations to reduce environmental impact across assets and service.
- Allowing them to leverage data for insights, meaning better informed decisions over high-impact levers such as lowering emissions in material selection.
- Delivering business model transformation, such as long-term capital investment planning that supports a shift to electric vehicle use or renewable energy integration.

Industrial AI changes how value is created, not just how costs are managed. Decision-analytics platforms like IFS Copperleaf use AI to test long-term investment portfolios against climate and demand scenarios, quantify risk and show which options deliver the highest value over time. That shifts capex planning into a repeatable, evidence-based discipline that links asset strategy to resilience goals and produces a clear audit trail for boards, regulators and lenders.

Research shows that applying optimisation and value-based decision-analytics tools to capital investment planning can increase portfolio value by up to 20 percent[22], while reducing planning time by 50 percent and lowering risk exposure by up to 200 percent for the same spend[23]. Just as importantly, these frameworks embed sustainability into financial decision-making, **quantifying outcomes such as decarbonization, resilience, and social value alongside cost and risk**, making long-term investment strategies both economically and environmentally defensible.

In **circular and outcome-based business models**, digital twins play an increasingly important role by providing a shared virtual environment to design, test and monitor assets throughout their lifecycle. This enables greater transparency, performance verification, and traceability–all essential to scaling sustainable business models.

Companies that act now can lower costs and carbon simultaneously. AI-enabled efficiency gains can deliver measurable costs savings and build resilience against market volatility, energy fluctuations and supply chain disruption for the next phase of transition.

To accelerate progress, three priorities stand out:

1. **Start with measurable use cases.** Predictive maintenance, scheduling optimisation, and process control deliver fast returns.
2. **Invest in data readiness.** Clean, connected data supports scalability and confidence.
3. **Embed trust early.** As AI-driven insights and autonomous systems are increasingly embedded into operations, trust becomes not only a precondition but a core design principle. In combination, trusted governance, secure and resilient infrastructure and sustainable compute create the foundation for industrial AI that not only performs but endures, delivering value with integrity for people, environment and performance.

Industrial AI is no longer a test case. It is already driving transformation. The companies that move first will not only reach net zero faster but set new standards for how sustainable industry operates.

22. Utility Week, Decision Analytics for Net Zero and ESG, 2021.
23. Copperleaf, Asset Management and ESG: Aligning Investment Decisions with ESG Goals and Objectives, 2024.

About IFS

IFS is the world's leading provider of Industrial AI and enterprise software for hardcore businesses that service, power, and protect our planet. Our technology enables businesses which manufacture goods, maintain complex assets, and manage service-focused operations to unlock the transformative power of Industrial AI™ to enhance productivity, efficiency, and sustainability.

Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers – at the Moment of Service™.

The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector. Our global team of over 7,000 employees every day live our values of agility, trustworthiness, grit and collaboration in how we support thousands of customers.

Learn more about how our enterprise software solutions can help your business today at ifs.com.

#MomentOfService

Production: IFS, November 2025.