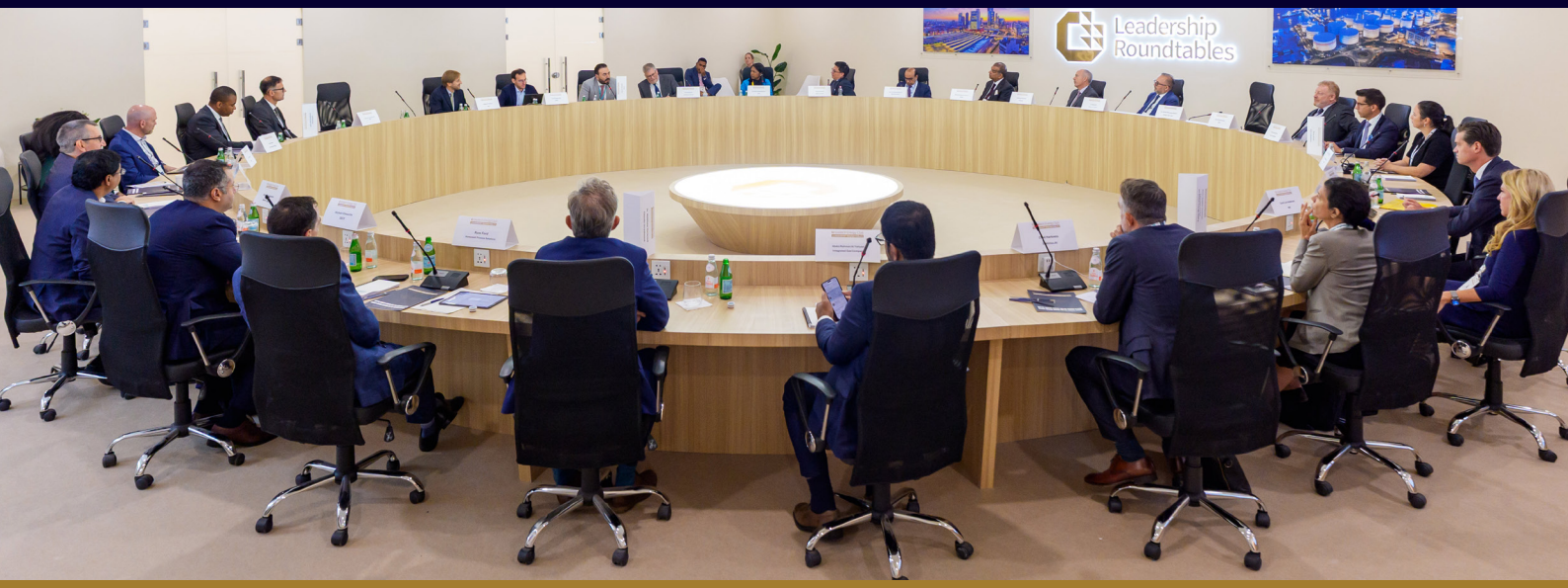
Gastech Energy Club

LEADERSHIP ROUNDTABLES

Harnessing AI to power energy efficiencies and accelerate climate innovation



KEY OUTCOME REPORT

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Roundtable abstract

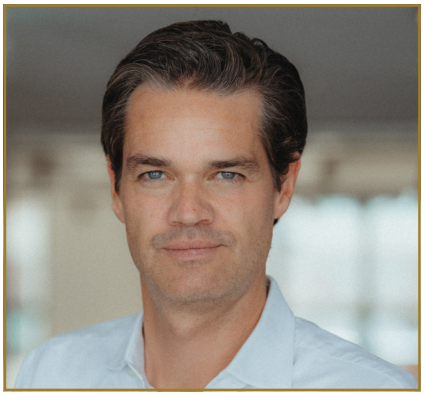
Artificial intelligence (AI) is a game-changing tool for accelerating global climate innovation and unlocking new sustainability actions at unprecedented scale and pace. AI can be used effectively for energy optimisation and efficiency: its ability to forecast energy supply and demand with high accuracy allows energy providers to balance the grid more effectively, reduce intermittency and ensure a stable supply of electricity. This predictive analysis is also expected to be critical in identifying optimal times to introduce new renewable energy onto the grid.

AI also has the significant potential to reduce global methane leaks and emissions. AI-powered detection and monitoring tools can use satellite data to identify emissions in real time and optimise gas asset operations with predictive maintenance.

Despite its clear potential, the widespread adoption of AI faces significant challenges. The high cost of implementation is a barrier for developing countries or small enterprises and AI systems are power-hungry, raising concerns around their true contribution to a net zero future. Furthermore, the integration of AI across the energy sector will require a new workforce to fill the digital skills gaps needed to power a transforming global economy.

Roundtable attendees discussed how AI can be leveraged across emission reduction strategies, projects and policies to deliver an accelerated energy transition.

HOST



Dr. Frederik Doyé
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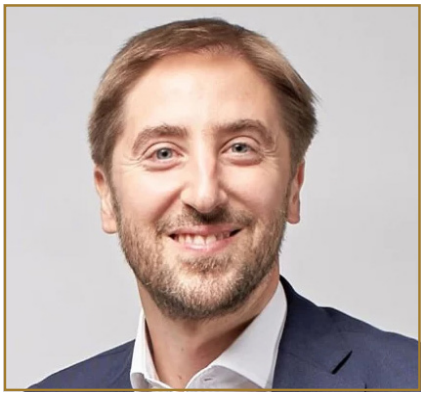

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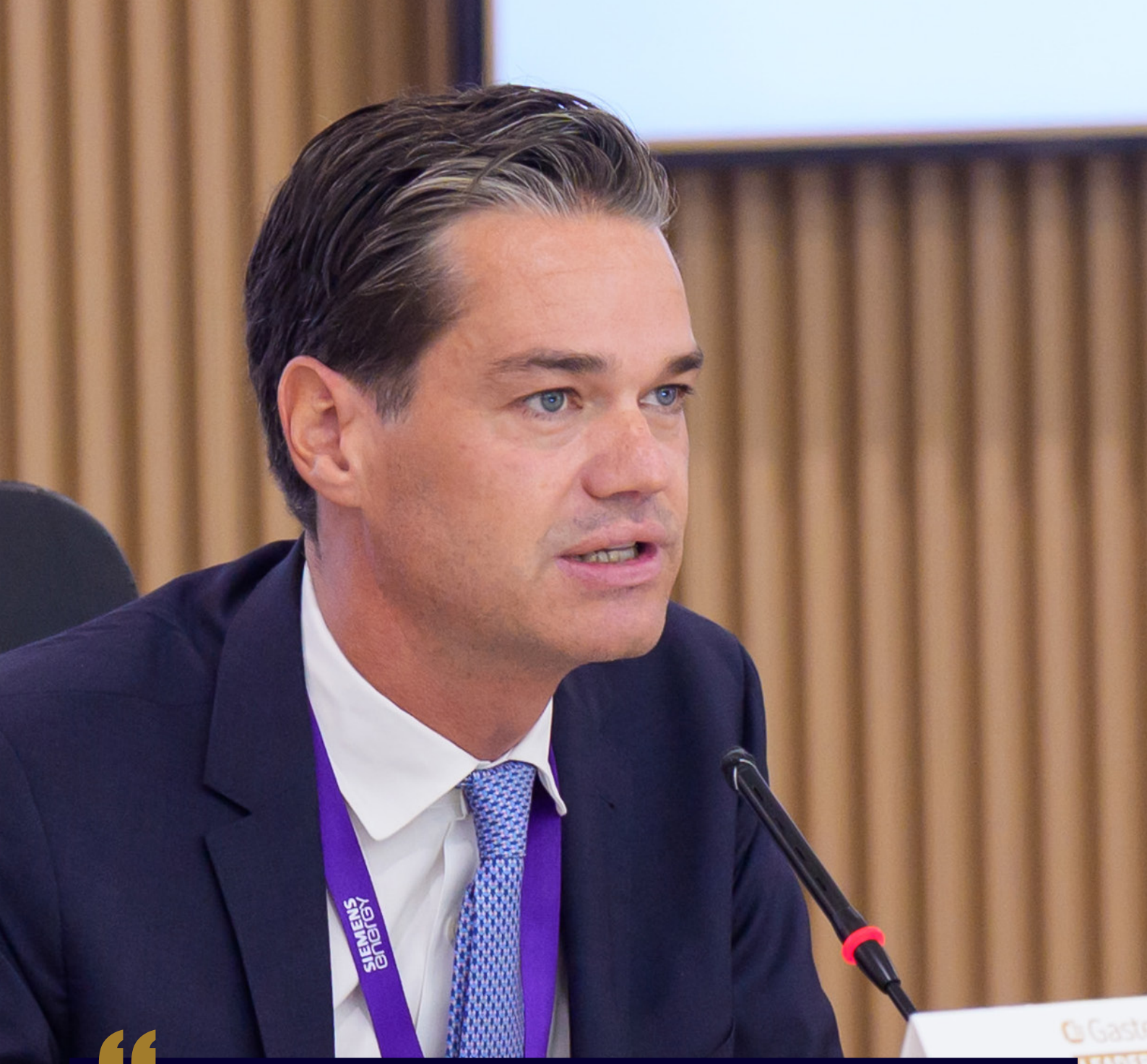


This roundtable underscored AI's transformative role in energy. For our customers, our AI solutions are extending the life of their wind turbine blades, reducing emissions in their facilities through AI-powered asset optimisation, and enhancing reliability and safety in their power plants through autonomous control and predictive maintenance. Internally, we are aiming to make our processes more efficient and faster as well as developing clear internal and external use cases. As AI's energy demands surge, our energy solutions along the entire value chain are increasingly powering data centres all over the world. We're proud to support the future of this intelligent infrastructure by enabling sustainable digital growth."

Dr. Frederik Doyé, SVP – Hub Europe, Siemens Energy

Roundtable outcomes

No comments are attributed to any one participant.

Current use cases and benefits

During the roundtable most advanced AI use cases around energy and sustainability were discussed in various sectors. In grid and system operations, it is improving renewable forecasting, enabling more accurate balancing of fluctuating demand, and helping integrate decarbonisation into allocation and trading decisions. Within industrial processes, advanced control systems powered by self-learning algorithms are adjusting to operating scenarios in real time, achieving efficiency improvements of several percentage points within weeks and providing a rapid return on investment. Safety and productivity are also being enhanced as autonomous systems begin to operate facilities independently, reducing the need for human intervention in hazardous environments while streamlining workflows and accelerating internal processes. In parallel, environmental monitoring has been transformed by AI's ability to process massive amounts of satellite and sensor data, enabling the detection and attribution of methane and carbon dioxide emissions to specific operators. This strengthens accountability, supports advocacy, and informs policymaking. Demonstration projects that integrate renewables, hydrogen, storage, and AI illustrate the potential for aligning economic performance with environmental outcomes.

Future opportunities

Looking ahead, participants saw several areas where AI could drive the next wave of transformation.

- The development of autonomous systems, including unmanned platforms and closed-loop power plants, promises significant gains in efficiency and safety. Mobile AI and robotics, such as drones, robotic inspection tools, and unmanned vessels, are expected to further reduce hazardous work while enabling more frequent and precise monitoring of assets.

- Advances in predictive operations will support demand forecasting, swing management, and maintenance strategies that are both more efficient and more sustainable, embedding decarbonisation into routine decision-making.

- Beyond these near-term applications, new computational frontiers such as quantum computing, multimodal AI methods, and the merging of AI with cloud platforms are likely to expand the scope of what is technically possible while raising fresh questions around governance and sustainability.

Major hurdles slowing AI adoption or scaling

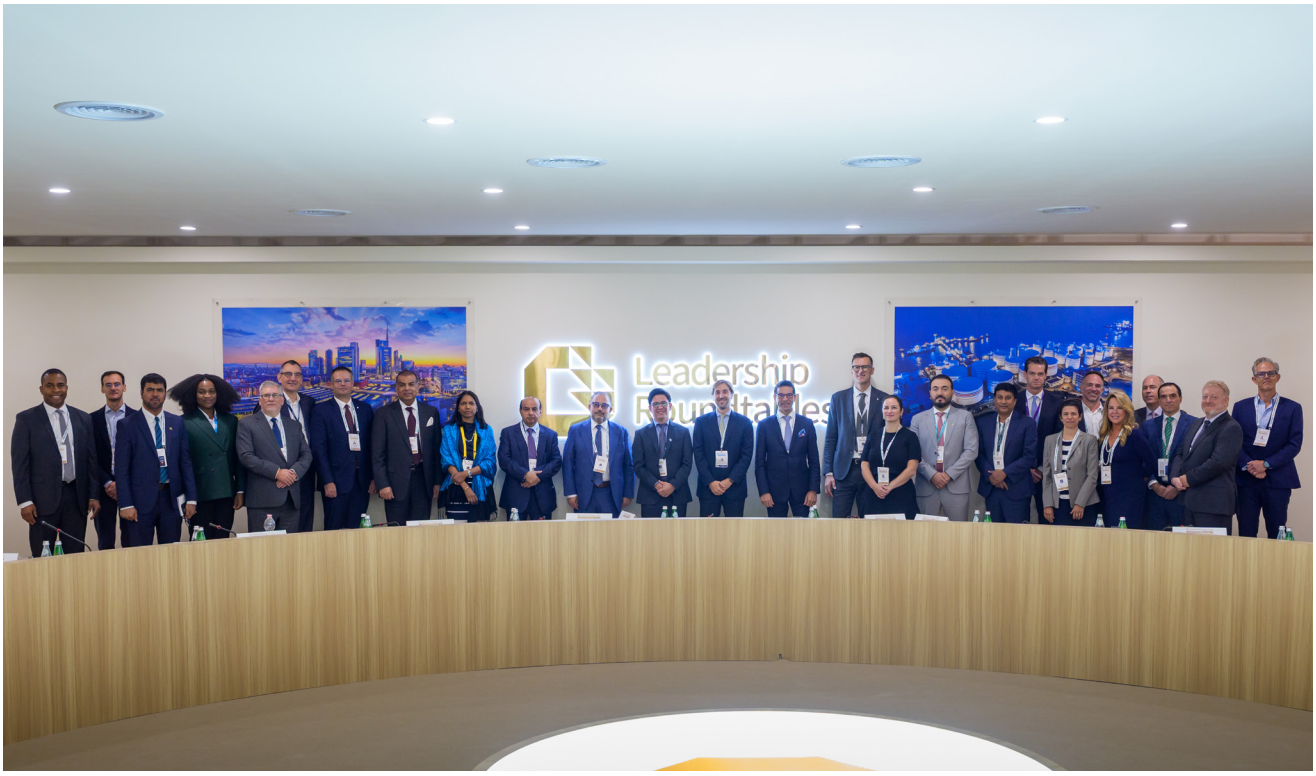
Despite momentum, significant barriers remain to widespread adoption. On the technical side, data quality gaps, fragile models, cybersecurity risks, and lack of common standards limit reliability. For critical infrastructure, error tolerances common in other domains are unacceptable, meaning that "physical AI" must deliver complete accuracy, resilience, and auditability. Economic and policy constraints also weigh heavily, with complex and costly AI stacks slowing deployment and regional differences in subsidies, pricing structures, and grid rules shaping uneven adoption. At the same time, the resource intensity of AI itself is rising, requiring efficiency gains to prevent costs from being passed on to consumers. Organisational and cultural hurdles continue to surface, as workforce resistance, skills shortages, and cultural inertia hinder transformation. Engineers and operators need to be convinced of AI's tangible value, and leadership must align incentives and foster agile ways of working to enable systemic change. Finally, governance and sustainability were highlighted as decisive factors. AI's growing energy and water consumption raise questions about its own footprint, and without strong frameworks of fairness, reliability, safety, privacy, inclusiveness, transparency, and accountability, societal trust in AI will remain fragile.

Lessons for deploying AI at scale

The roundtable emphasized that scaling AI depends on organisational readiness as much as technical innovation: change management emerged as a central need and major challenge to effectively scale adoption across organisation and capture the full power of AI. Algorithms and tools must be embedded into operating models and processes rather than treated as a series of digital add-ons, with the most effective deployments arising when engineering expertise is combined with algorithmic capabilities. Human-AI collaboration was viewed as essential: rather than displacing workers, AI should serve as a partner, with oversight mechanisms ensuring that flaws or biases do not compromise outcomes. Domain knowledge was consistently described as a prerequisite for success, since algorithms must be grounded in an understanding of real industrial processes to create value. Collaboration and partnership emerged as another central theme, with co-innovation across companies, regulators, and start-ups seen as necessary to move beyond isolated proofs-of-concept. Underpinning all of this is governance and trust: adoption at scale requires predictable outcomes, transparent methods, and compelling business cases to gain support from engineers, investors, and policymakers.

Closing reflections

The roundtable concluded that AI's potential to transform the energy sector is undeniable, but realising this potential will require progress on multiple fronts. Decarbonising AI itself, ensuring sustainable employment models, and embracing open collaboration were seen as vital priorities. Most of all, participants agreed that governance will determine whether AI earns the trust of workers, regulators, and society. As highlighted by BCG's experience, a useful rule of thumb is that only 30 percent of success in AI comes from algorithms and technology, while 70 percent depends on organisational structures, governance, and cultural readiness. If that balance is respected, AI can evolve from a promising digital tool into a foundational enabler of a cleaner, safer, and more resilient energy system.



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