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The Al-Attiyah Foundation's second webinar of 2025, "Harnessing AI for a Sustainable Energy Future", was held on the 5th of June. The debate convened an expert panel—featuring leaders in energy systems, AI, and data science—to explore the challenges organisations face in Artificial Intelligence (AI) adoption and practical strategies to overcome them. During the session, participants described in detail the transformative potential of AI to engender a more resilient, efficient and sustainable global energy system.

## WEBINAR WHITE PAPER

H.E. Abdullah bin Hamad Al-Attiyah founded the Foundation as a platform for knowledge exchange and support for the global community in the quest towards a sustainable energy future.

The Webinar Series is a crucial networking and learning opportunity in the calendar of industry CEOs members and Foundation partners.



Since 2020, the Foundation has staged a series of webinars, in partnership with the London Stock Exchange Group (LSEG), to explore key trends and insights in the energy sector during a period of unprecedented global uncertainty due to supply-chain constraints, extreme price volatility, the escalating climate crisis and geopolitical turmoil.

Artificial Intelligence (AI) is rapidly reshaping the global energy sector, revolutionising every stage of the value chain—from exploration and production to distribution and consumption. As the industry faces mounting pressure to cut costs, improve efficiency and accelerate the transition to cleaner energy, AI is emerging as a critical tool to drive innovation and resilience.

The sector is already making strides in leveraging AI's potential. Recent estimates indicate that AI serves more than 50 different uses across the energy system, with the market for AI-driven solutions projected to reach as much as US\$13 billion.

In upstream operations, AI pinpoints optimal drilling sites, maximises operational efficiency and minimises equipment failures through predictive maintenance. Mid-stream, AI-driven algorithms are optimising pipeline routing, anticipating equipment malfunctions and streamlining supply-chain logistics. Downstream, AI is improving refining and fuel distribution by reducing waste and enhancing safety.

Perhaps nowhere is AI's impact more visible than in electricity generation and grid management. With renewable sources such as solar and wind becoming increasingly prevalent, grid operators rely on AI to forecast demand, balance supply and demand in real time, and prevent outages. AI is also strengthening regulatory compliance by offering tools for proactive monitoring, helping companies stay ahead of changes and reduce operational risk.

Without AI, system operators and utilities will struggle to fully leverage the wealth of new data sources and processes enabled by emerging digital technologies, missing out on significant benefits. However, before scaling AI across the sector, it is crucial to address associated risks, including cybersecurity and privacy threats.





Mass adoption of AI is accelerating, bringing a growing appetite for computational power and consequently greater electricity consumption also, panellists told the webinar audience.

"There's an ongoing debate about whether we are in a temporary AI bubble or if it's something long-term, structural which will create a new and large sector for energy demand," said Marina Tsygankova, Director of Global Gas & Coal Research at London Stock Exchange Group (LSEG).

Submitting a single query on an AI platform such as ChatGPT consumes roughly three times as much power as an internet-search request, she noted, while asking an AI chatbot to create one image will consume one-fourth of the power needed to fully charge a smartphone from zero.

"As AI becomes more embedded in our daily lives, the energy demands might be significant," she said.

In the United States, 40 percent of the electricity that data centres consume already comes from gas-to-power, and Chevron is building dedicated gas-fired power stations to supply them.

Globally, total energy demand is set to rise 26 per cent by 2030, Ms Tsygankova estimates, although only a small fraction of that increase will arise from data centres; surging air-conditioning loads and electric-vehicle charging are likely to be more consequential.

In the first audience poll, respondents weighed where AI could most effectively improve efficiency in the energy-production

## WEBINAR SPEAKERS

### Moderator:



**Nawied Jabarkhyl,**  
Senior Director &  
Head of International  
Media Relations, APCO  
Worldwide

### Speaker



**Professor Tadhg  
O'Donovan,** Chief  
Scientist, Heriot-Watt  
University

### Speaker



**Marina Tsygankova,**  
Director of Global Gas &  
Coal Research, London  
Stock Exchange Group  
(LSEG)

### Speaker



**Adrian Gonzalez,**  
Programme Officer –  
Innovation and End-use  
Sectors, International  
Renewable Energy  
Agency (IRENA)

### Speaker



**Liliane Lindsay,**  
Principal Consultant, PA  
Consulting

process: 40 percent chose optimising grid management, another 40 percent pointed to integrating renewables and 20 percent highlighted enhancing predictive maintenance.

Professor Tadhg O'Donovan, Chief Scientist at Heriot Watt University, cautioned that society is probably not yet fully equipped to deal with the large and increasing demand for AI "but we're on the right path – it's not new for the energy sector to have to balance complex phenomena that aren't immediately evident."

Energy companies currently have only limited demand for AI applications from an operational standpoint, said Liliane Lindsay, Principal Consultant at PA Consulting. "That's largely due to some of the systemic challenges across the energy sector ... it does create barriers to those tougher decarbonisation challenges," she explained.

Adrian Gonzalez, Programme Officer for Innovation and End-use Sectors at the International Renewable Energy Agency (IRENA), agreed that "AI can be a booster for renewable deployment". "The demand that AI-focused data centres will bring to the power system is not problematic whenever there is a proper sourcing, which of course we're talking about renewable sourcing."

Nonetheless, he warned against prioritising the IT sector's needs over those of wider society. Extra renewables capacity should be added "precisely to prevent stealing this clean energy from other users or access to

electricity from the people, particularly in the global south – we shouldn't prioritise data centres over the population's needs."

A second poll asked, which segment of the energy value chain would benefit most from AI adoption. A resounding 80 percent of participants selected energy storage and distribution, while 20 percent opted for exploration and extraction. No one chose energy-consumption forecasting, yet Ms Tsygankova disagreed with the majority, arguing that forecasting would ultimately reap the greatest rewards. Environmental monitoring and compliance also received zero votes.





Mr O'Donovan suggested the answer may be more nuanced, commenting: "These are interlinked, and one of the benefits of AI is that it brings together data sets and interlinked options. AI is going to help us design future infrastructure – what proportion of storage do we need? How does that intersect with future demand? There are ways in which (AI) is going to impinge on economics on a very individual way from a domestic setting to large-scale organisations. How are we going to incentivise a collective response to energy decarbonisation?"

The possibilities are near-endless when it comes to AI, especially in the energy sector, Ms Lindsay predicted, although she conceded there were plentiful barriers preventing widespread adoption.

AI can already optimise routine maintenance schedules and predict failures before they occur. This reduces operating costs as well as electricity production downtime, leading to a more efficient energy generation system.

"These aren't new solutions, they're just becoming increasingly more powerful with AI," said Ms Lindsay. "The biggest challenge is commercialisation."

The energy industry is highly complex, both in developing new generation capacity and in balancing supply and demand in real time—all while adhering to varying regulatory, legal and policy frameworks.

"The massive opportunity for AI is to take all of those interdependencies, all that real-time data and create a more efficient, more powerful solution that enables us to



use the existing generation capacity more effectively and improve our sustainability targets," said Ms Lindsay.

In order to maximise the benefits of deploying AI, sector stakeholders must first determine whether the overriding aim is maximum efficiency, lowest cost or minimal environmental impact over each asset's lifetime, Mr O'Donovan argued.

A third poll revealed that 50 percent of attendees viewed the lack of a skilled workforce as the biggest obstacle to integrating AI in the energy sector; 33 per cent cited high initial investment costs and 17 per cent pointed to regulatory and compliance barriers.

An ambiguous regulatory environment is a major impediment, warned both Ms Lindsay and Ms Tsygankova.

"When it comes to the energy sector, a massive confluence of events in recent years has impacted the appetite for adoption," Ms Lindsay said, citing high interest rates, persistent inflation, the Ukraine conflict, Europe's energy crisis and lingering Covid-19 supply-chain disruptions.

"Many energy developers and retail companies are more focused on keeping the lights on and prices low rather than focusing on innovation and AI adoption," she explained.

Looking ahead, AI is poised to accelerate advances in materials science, predicted Mr Gonzalez, including the development of new chemicals for photovoltaic panels.

"There's also huge potential for geothermal and ocean energies that are often overlooked because in the past we had issues identifying geographical areas with high potential for these," he said.

"AI has a major role to play in the coming years for renewables, starting from better forecasting, for higher integration of variable renewables ... and operational automation in the power system," added Mr Gonzalez.







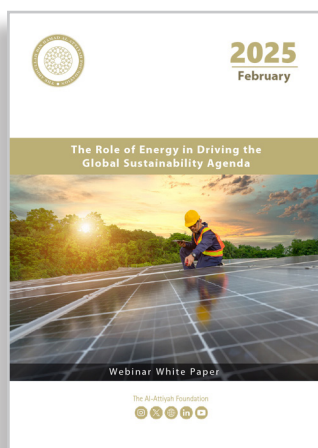
The webinar's expert participants described in detail the transformative potential of AI to engender a more resilient, efficient and sustainable global energy system.

AI-enabled analytics, predictive maintenance and demand-supply balancing are already delivering tangible benefits, yet the technology's full impact will depend on addressing infrastructure constraints, workforce skills shortages and an evolving regulatory landscape.

By viewing AI not merely as a bolt-on solution but as a foundational pillar of future energy strategies, companies, policymakers and investors can accelerate decarbonisation while meeting increasing demand for electricity.

Harnessing that opportunity will require concerted collaboration across the public and private sectors, strategic investment in grid and data-centre capacity and a clear policy framework that encourages innovation while safeguarding consumers. If these conditions are met, AI should become a potent catalyst for the clean-energy transition.

Have you missed a previous issue? All past issues of the Al-Attayah Foundation's Research Series, both Energy and Sustainability Development, and Whitepapers can be found on the Foundation's website at [www.abhafoundation.org/publications](http://www.abhafoundation.org/publications)



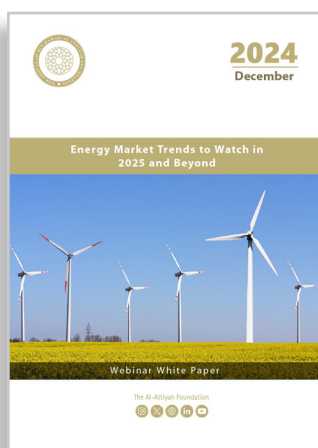
**February – 2025**

## The Role of Energy in Driving the Global Sustainability Agenda

The Abdullah Bin Hamad Al-Attayah International Foundation for Energy and Sustainable Development provides robust and practical knowledge and insights into global energy and sustainable development topics, sharing these for the benefit of the Foundation's members and community.



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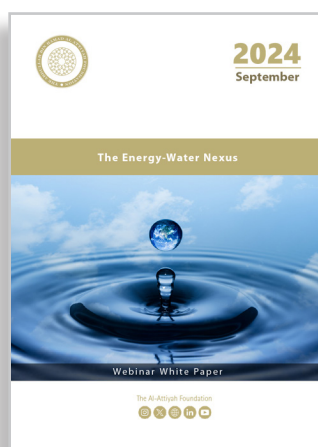
**December – 2024**

## Energy Market Trends to Watch in 2025 and Beyond

The webinar "Energy Market Trends to Watch in 2025 and Beyond," held on December 5, explored the critical factors shaping the global energy landscape amid economic and geopolitical uncertainties, shifting oil and gas supply dynamics, and the rapid expansion of renewables.



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**September – 2024**

## The Energy-Water Nexus

The Abdullah bin Hamad Al-Attayah Foundation for Energy and Sustainable Development provides robust and practical knowledge and insights on global energy and sustainable development topics, communicating these for the benefit of the Foundation's members and community.



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Our partners collaborate with The Al-Attiyah Foundation on various projects and research within the themes of energy and sustainable development.







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