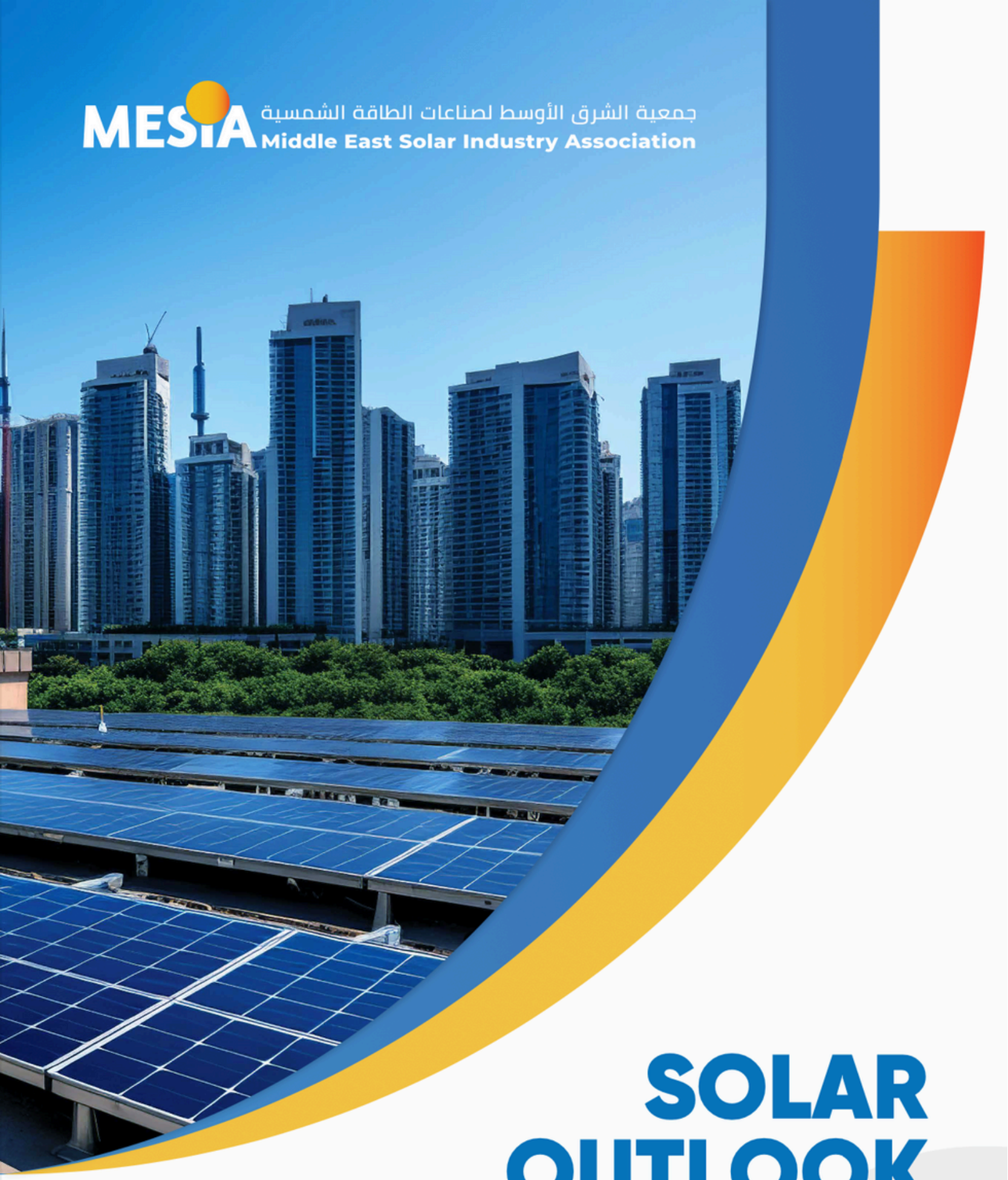
MESIA جمعية الشرق الأوسط لصناعات الطاقة الشمسية
Middle East Solar Industry Association



SOLAR OUTLOOK REPORT 2026

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ARTIFICIAL INTELLIGENCE AS A CATALYST FOR THE REGIONAL ENERGY TRANSITION

THE ENERGY-AI FEEDBACK LOOP TRANSFORMING THE MIDDLE EAST

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Artificial intelligence (AI) has a symbiotic relationship with solar energy:

1. AI relies on data centres, which in turn require new energy sources to come online rapidly.
2. Solar photovoltaic (PV) and battery energy storage systems (BESS) are the fastest to reach the market.
3. New data centres enable better AI tools, which solar technology companies utilise to optimise solar plant development costs, enhance energy production, and automate construction and operations and maintenance (O&M) work.

The joint advancement of AI, robotics, and solar technology is especially critical in the Middle East, where demand for data centres is expected to triple over the next five years, and where environmental conditions can create serious operational challenges for solar-plus-BESS projects. As demand for AI surges in the region – powered increasingly by large-scale solar – those same power plants now rely on advances in AI and robotics to operate reliably in the Middle East's harsh climate conditions.

DATA CENTRE DEMAND

Data centre spending in the Middle East and North Africa (MENA) is estimated to reach nearly $13 billion in 2026, representing a 37% year-on-year increase, according to Gartner. This growth is driven by the rapid expansion of cloud computing and AI as countries such as the UAE and Saudi Arabia position themselves as global AI hubs. PwC anticipates that data centre capacity in the region will triple over the next five years, from 1 GW in 2025 to 3.3 GW in 2030, driven by demand for generative AI and advanced machine-learning tools across governments, hyperscalers, and technology provider

Globally, data centre development requires a corresponding increase in local power generation. AI-focused data centres, in particular, can consume up to 10 times more power than traditional facilities, creating a new urgency for generation assets that can be deployed rapidly and deliver the lowest possible Levelized Cost of Energy (LCOE) over the plant's lifetime.

SOLAR'S SPEED TO POWER

Solar PV is currently the fastest-growing source of new power generation worldwide. Rystad Energy reports that more than half of all new capacity added in 2024 came from solar. It is also the quickest power-generation technology to deploy at scale. Once fully permitted, a 1 GW solar power plant can be built in a year or less for around $1 billion, compared to four years and $2 billion for natural gas, or 10 years and $15 billion for nuclear.

The case for solar-plus-BESS to support data-centre load growth is even stronger in the Middle East, where land constraints are minimal, and land costs are considerably lower than in major global data-centre hubs.

Conversely, the key challenges for MENA solar-plus-BESS projects stem from harsh desert conditions and their often remote locations. Persistent issues include

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worker safety risks and the difficulty of operating and maintaining these plants under extreme conditions – intense heat, high winds, and increased soiling from dust storms, to name a few.

Which leads us back to AI. Building on experience with delivering large-scale solar assets across the Middle East, AI-guided robotics is becoming essential for safe, reliable deployment in extreme desert conditions. Here is a snapshot of what this looks like today, and a glimpse of what is next.

DIGITAL AI OPTIMISES DESIGN, PROCUREMENT AND PERFORMANCE

The solar design phase is complex, and each decision can significantly affect project timelines and the LCOE. AI is particularly suited to managing this complexity and generating new efficiencies.

Large language models are increasingly embedded in solar workflows to streamline customer interactions, generate documentation, and interpret field notes. Emerging digital AI tools use contextual intelligence to provide actionable insights and real-time feedback. Design iterations can be produced more quickly and incorporate more variables, ranging from regional supply and stock keeping unit (SKU) counts to cost trade-offs and their combined impact on LCOE.

Digital twins are also becoming critical to plant installation and operational efficiency. They identify issues early and enable proactive mitigation strategies, thereby reducing costs. Drone imaging and sensor data constantly update nonlinear models of each plant component, enabling real-time optimisation of tracker angles, inverter set-points, and storage levels. Once a digital twin exists in the cloud, AI can forecast probable conditions and recommend – or eventually execute – the next best action in a continuous decision-making loop.

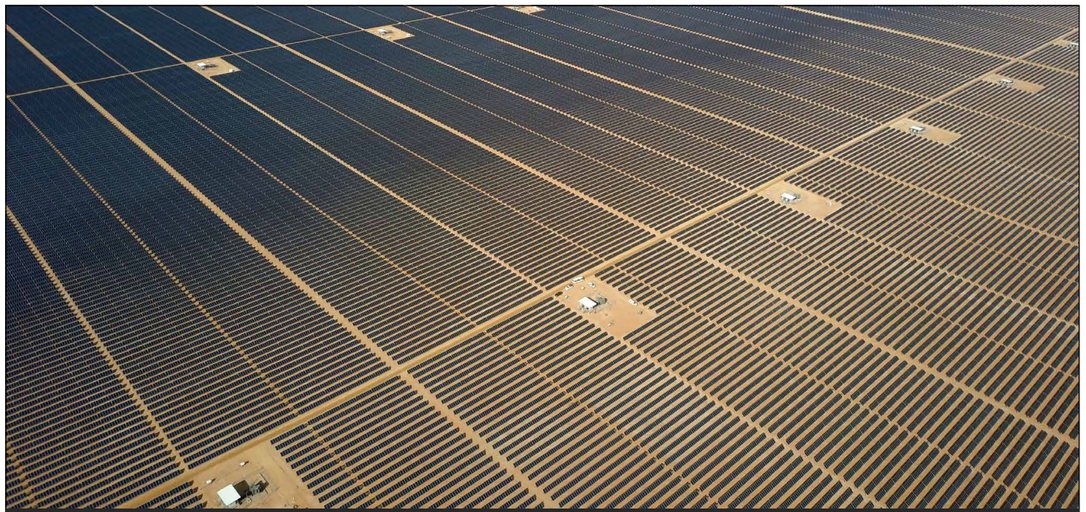

Figure [1] : Sakaka_NX_rows2_ACWA attr

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AUTOMATED CONSTRUCTION AND ROBOTIC MAINTENANCE

Automated installation processes are particularly valuable in remote desert environments. Commissioning and inspection can be carried out by ground and aerial robots using AI-driven detection and analytics to flag issues before they lead to failures.

For ongoing O&M, weather stations that record temperature, irradiance, wind speed, and direction can be integrated with drones and autonomous inspection robots that continuously patrol the field. These systems use pattern recognition to perform anomaly detection and predictive maintenance, which is vital given that an estimated 63% of underperformance, safety, and risk issues occur beneath solar panels and cannot be detected from aerial imagery alone.

Figure [2] : NX_Wright Solar

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WHAT'S NEXT: PHYSICAL AI AND AGENTIC AI AUTOMATION

Solar monitoring centres still require human operators to monitor screens 24/7. Improvements in agentic AI can further advance the decision-to-action model, enabling AI agents to identify issues, coordinate responses, and, in some cases, autonomously resolve problems before human intervention is required.

Installation robotics mark the next major shift, falling within the broader concept of physical AI. In the near future, construction robots could support the physical assembly of solar plants. Over time, coordinated fleets of aerial and terrestrial robots could operate in synchronised swarms, sharing data and adapting to each other's actions. This would enable more complex tasks such as joint lifting, dynamic re-routing in response to obstacles, or fully automated inspection sequences.

BOTTOM LINE

The MENA region is prioritising infrastructure for data centres and AI computing, which requires new power sources that can be rapidly deployed. Today, gigawatt-scale solar plants are being delivered at the lowest LCOE and more quickly than any comparable generation source, and performance will continue to improve as abundant operational data feed into advanced, connected AI systems. The result will be smarter decisions and faster actions across design, delivery, construction, and operations, strengthening energy resilience and safeguarding workers and power plant assets in all environments.

Source:

**Raptor Maps Global Solar Report 2025 Edition*
Based on the analysis of 67GWdc in 2024.

Source: Yellow Door Energy - Armacell Bahrain 1 MWp

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