

4IR Technologies:

**AI, Digital twins,
Autonomous systems**

Emirate:

Dubai

Maturity:



Operational Deployment

Type:

Public-Private

ENERGY

018

AI-Optimised Solar Tracking at Dubai's Solar Park (TrueCapture)

ACTORS

**Nextpower (formerly Nextracker)
Dubai Electricity and Water Authority (DEWA)
Shanghai Electric**

SNAPSHOT

TrueCapture applies machine learning to the control of utility-scale solar trackers. These systems rotate photovoltaic panels to follow the sun and maximise energy capture. Conventional systems typically move every row in a solar field to the same angle at the same time. TrueCapture instead controls each row independently, combining panel-mounted sensors, a digital model of the site and machine learning to determine the most effective angle from one minute to the next.¹ The software operates on trackers designed with independent-row architecture. Nextpower, then operating as Nextracker, supplied more than 1 gigawatt of these systems to the fifth phase of the Mohammed bin Rashid Al Maktoum Solar Park through Shanghai Electric.²

WHY IT MATTERS

Under the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Carbon Emissions Strategy 2050, Dubai aims for 100% of its energy production capacity to come from clean sources by 2050. The Mohammed bin Rashid Al Maktoum Solar Park is a key project supporting that transition and is now planned to exceed 8,000 megawatts of capacity by 2030.³ At that scale, even a small improvement in yield translates into a substantial amount of additional electricity over the life of the asset. Solar fields are not perfectly flat or uniform. Variations in terrain and construction height can cause rows to shade one another when the sun is low. Conventional tracking systems move all rows to the same angle, limiting their ability to account for these local differences.⁴

Desert conditions create both opportunities and constraints. Highly reflective ground can increase the amount of light reaching the rear surface of bifacial panels, improving output in high-albedo environments.⁵ Dust and haze can have the opposite effect by scattering sunlight across the sky. Under those conditions, the angle that best captures direct sunlight may no longer produce the highest yield.⁶

Row-level control allows each tracker to respond to the conditions around it. The system can adjust individual rows to reduce shading and, during periods of diffuse light, move panels towards a flatter position to capture more light from across the sky.⁷

HOW THE TECHNOLOGY WORKS

The system begins with a digital twin of the solar plant, modelling the terrain, array layout, and tracker geometry so the software can understand how each row sits in relation to its neighbours and the surrounding ground.⁸ Sensors on the panels then report real-time shading conditions, allowing the digital twin to reflect how the site is performing in operation rather than only how it was designed.⁹

The control loop runs continuously. Irradiance and weather data are processed through machine-learning algorithms, which calculate the most effective angle for each tracker row.¹⁰ Those instructions are sent to self-powered wireless controllers and coordinated with the plant's supervisory control system.¹¹

Several optimisation modes can operate simultaneously. Row-to-row shade avoidance adjusts individual trackers to reduce morning and evening shading, while diffuse-light tracking moves panels towards a flatter angle when scattered light produces more energy than direct tracking.¹² Split Boost applies to compatible half-cell modules. It allows controlled shading across the lower half of a panel so that the upper half remains fully exposed.¹³ Zonal Diffuse adds higher-resolution sensing, enabling trackers to respond to cloud cover moving across different parts of the plant.¹⁴

**UP TO
6%
YIELD INCREASE**
in annual energy output

**1GW+
TRACKERS SUPPLIED**
to Solar Park Phase 5



IMPACT AND RESULTS

Nexttracker's filings with the United States Securities and Exchange Commission estimate that TrueCapture can increase annual energy yield by 1% to 3% on most projects, with gains of up to 6% at sites where terrain, construction variation, plant design, and weather create greater scope for optimisation.¹⁵ Its current product literature cites gains of up to 4%.¹⁶

Independent assessments have also recorded measurable improvements. At the 40-megawatt Beacon 5 solar plant in California's Mojave Desert, Black & Veatch measured a 2.2% increase in energy yield relative to a control group.¹⁷ ICF reviewed four utility-scale projects in the United States, England, and Australia and reported gains at each site.¹⁸

At the Mohammed bin Rashid Al Maktoum Solar Park, DEWA increased the rated capacity of the first project in Phase 5 from 300 megawatts to 330 megawatts, attributing the increase to the combination of bifacial modules and single-axis tracking.¹⁹



WHAT'S NEXT

Nextracker renamed itself Nextpower in November 2025, signalling a broader shift from solar tracking towards integrated power-plant technology. It also announced a new line of utility-scale power-conversion systems, with first shipments expected in 2026.²⁰ TrueCapture and the rest of its software portfolio continue under the new brand.

Across the region, the software is being deployed alongside the tracking hardware. TrueCapture was selected with Nextracker systems for the first phase of Saudi Arabia's 450-megawatt Sudair solar plant, applying the same combination under comparable desert conditions.²¹ For Dubai, where several gigawatts of single-axis tracking are already installed, row-level optimisation offers a way to increase output from existing plants through software rather than new construction.²²

Marco Garcia, Chief Commercial Officer of Nextracker, set out why the technology particularly suits this part of the world: “Bifacial optimized trackers and TrueCapture technology are particularly well suited to maximize solar energy production on power plant facilities in desert environments. The desert has a very high albedo, or brightness of the ground. Over the life of a solar plant, this makes a significant difference in the total amount of energy produced.”²³

REFERENCES

1. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
2. Nextracker (2020) 'Nextracker Selected by Shanghai Electric to Elevate Energy Output for Middle East's Largest Solar Park'. 17 September. <https://www.prnewswire.com/news-releases/nextracker-selected-by-shanghai-electric-to-elevate-energy-output-for-middle-east-s-largest-solar-park-301132865.html>
3. Dubai Electricity and Water Authority (n.d.) 'Mohammed bin Rashid Al Maktoum Solar Park'. <https://www.dewa.gov.ae/en/about-us/strategic-initiatives/mbr-solar-park> (retrieved 2 June 2026)
4. SolarQuarter (2026) 'Validated Gains For Real-World Solar Sites'. 17 July. <https://solarquarter.com/2026/07/17/validated-gains-for-real-world-solar-sites/>
5. Nextracker (2022) 'Nextracker Solar Trackers and TrueCapture Machine Learning Software have been selected for 450 MW Sudair Solar Energy Project, Saudi Arabia's Largest Solar Project'. 28 March. <https://www.prnewswire.com/news-releases/nextracker-solar-trackers-and-truecapture-machine-learning-software-have-been-selected-for-450-mw-sudair-solar-energy-project-saudi-arabias-largest-solar-project-301511430.html>
6. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
7. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
8. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
9. PV Tech (2017) 'NEXTracker's advanced tracker control system boost yield with self-learning'. 11 July. <https://www.pv-tech.org/nextrackers-advanced-tracker-control-system-boost-yield-with-self-learning/>
10. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
11. PV Tech (2017) 'NEXTracker's advanced tracker control system boost yield with self-learning'. 11 July. <https://www.pv-tech.org/nextrackers-advanced-tracker-control-system-boost-yield-with-self-learning/>
12. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
13. SolarQuarter (2026) 'Validated Gains For Real-World Solar Sites'. 17 July. <https://solarquarter.com/2026/07/17/validated-gains-for-real-world-solar-sites/>
14. Solar Power World (2023) 'Nextracker updates portfolio of solar tracker software and hardware'. 6 September. <https://www.solarpowerworldonline.com/2023/09/nextracker-updates-portfolio-of-solar-tracker-software-and-hardware/>
15. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
16. SolarQuarter (2026) 'Validated Gains For Real-World Solar Sites'. 17 July. <https://solarquarter.com/2026/07/17/validated-gains-for-real-world-solar-sites/>
17. pv magazine USA (2022) 'Study shows that Nextracker's machine learning software improves solar plant output'. 27 September. <https://pv-magazine-usa.com/2022/09/27/study-shows-that-nextrackers-machine-learning-software-improves-solar-plant-output/>
18. Nextracker (2024) 'TrueCapture Outperforms Modeled Energy Yield Projections in ICF Engineering Report'. June. <https://www.nextracker.com/2024/06/truecapture-outperforms-modeled-energy-yield-projections-in-icf-engineering-report-2/>
19. Dubai Electricity and Water Authority (2022) 'DEWA raises production capacity of the first project of the Mohammed bin Rashid Al Maktoum Solar Park's fifth phase to 330MW'. 17 January. <https://www.pv-magazine.com/press-releases/dewa-raises-production-capacity-of-the-first-project-of-the-mohammed-bin-rashid-al-maktoum-solar-parks-fifth-phase-to-330mw/>
20. Nextpower (2025) 'Nextracker Rebrands as Nextpower to Reflect the Company's Position as an Integrated Power Technology Innovator'. 12 November. <https://nextpower.com/post/press-release/nextracker-rebrands-as-nextpower-integrated-power-technology-innovator>
21. Nextracker (2022) 'Nextracker Solar Trackers and TrueCapture Machine Learning Software have been selected for 450 MW Sudair Solar Energy Project, Saudi Arabia's Largest Solar Project'. 28 March. <https://www.prnewswire.com/news-releases/nextracker-solar-trackers-and-truecapture-machine-learning-software-have-been-selected-for-450-mw-sudair-solar-energy-project-saudi-arabias-largest-solar-project-301511430.html>
22. Nextracker (2021) 'Form DRS/A, Draft Registration Statement'. United States Securities and Exchange Commission. <https://www.sec.gov/Archives/edgar/data/1852131/000095012321007862/filename1.htm>
23. Nextracker (2022) 'Nextracker Solar Trackers and TrueCapture Machine Learning Software have been selected for 450 MW Sudair Solar Energy Project, Saudi Arabia's Largest Solar Project'. 28 March. <https://www.prnewswire.com/news-releases/nextracker-solar-trackers-and-truecapture-machine-learning-software-have-been-selected-for-450-mw-sudair-solar-energy-project-saudi-arabias-largest-solar-project-301511430.html>