



Maximizing solar inverter performance: emerging opportunities in repowering

In the rapidly evolving field of renewable energy, repowering solar inverters has emerged as a strategic solution to enhance the performance, efficiency, and longevity of photovoltaic (PV) systems. In simple terms, repowering involves upgrading or replacing components of existing solar system setups to adapt to technological advancements, mitigate operational issues, and comply with evolving regulatory standards.

The market for PV inverter repowering is poised for exponential growth, fuelled by several industry trends and market dynamics. The reduction in prices of PV modules and inverters, over the past decade, have created significant opportunities for the replacement of existing systems. It is estimated that by 2030, the capacity of 10-year-old PV systems will quintuple to reach a staggering 700 GW globally, underscoring the immense potential for repowering initiatives.

The demand for inverter replacement is expected to grow from 40 GW in 2023 to 116GW in 2030, far outpacing previous predictions, according to S&P Global Commodity Insights.

The role of inverters in repowering

The inverter is a fundamental component of any PV system, and like any electrical component, over time they can experience efficiency loss, reliability issues, or compatibility constraints with modern and emerging technology. Simply put, repowering is becoming ever more essential to optimize overall system performance. Technological advancements in inverter design offer improved efficiency, grid integration capabilities, and enhanced

monitoring features, rendering older inverters obsolete in comparison.

Additionally, changing regulatory landscapes and evolving grid codes necessitate the adoption of modern inverters to ensure compliance with industry standards. Repowering presents an opportunity to bring existing installations up to current compliance standards with relevant codes and regulations such as the IET Wiring Regulations (BS 7671) and electrical safety standards like IEC 62446 for PV systems.

Several factors influence the decision to repower solar inverters, ranging from technological considerations to environmental and economic factors. In more industrial settings the lifespan of inverters is influenced by weather conditions, installation environments, and maintenance practices. Inverters exposed to extreme temperatures, humidity, or corrosive elements are more prone to premature failure, necessitating proactive repowering strategies to mitigate downtime and operational disruptions.

The development and reliability of inverter designs, adhering to international standards such as IEC 62093, play a crucial role in

enhancing the longevity and robustness of solar inverters. Unforeseen events, such as manufacturer exits from the market or geopolitical tensions affecting supply chains, can accelerate the need for repowering by rendering warranties void or limiting access to spare parts.

Residential trends

In the residential sector, homeowners are increasingly opting to replace outdated inverters with modern counterparts equipped with advanced energy monitoring, communication features, and compatibility with energy storage systems. Modern inverters become imperative for homeowners looking for access to a complete 'smart home' ecosystem. Critically, the vast majority of residential PV installations run on a single inverter; the failure of which results in a complete loss of solar power generation.

The increasing size of residential PV systems since 2010 has accelerated the demand for repowering to refresh to more efficient and reliable systems. Repowering extends the lifespan of PV systems, and by leveraging new features and functionalities, such as grid-support capabilities and enhanced communication protocols, system owners



Sandy Woodward

can unlock even greater savings through participation in growing demand response programs, such as the Saving Sessions offered by utility supplier Octopus Energy.

What to expect for commercial systems

Large-scale repowering projects require meticulous planning to minimize downtime and operational disruptions. System integration, compatibility issues, and logistical considerations, such as roof access and business continuity, must be carefully managed to ensure project success. Additionally, navigating regulatory requirements and compliance standards adds complexity to repowering initiatives, requiring close collaboration between all

stakeholders. Though that may all sound daunting, the challenges pale in comparison to the benefits.

Forniture Sim Srl, an installer of Solis inverters in Italy, recently completed a complex repowering project on a commercial site and estimates impressive results. The project saw the integration of new bifacial modules, allowing for greater power generation, and in turn required upgraded and more powerful inverters to support the new input current levels of the modules.

Ing. Nicola Traficante from Forniture Sim Srl comments, 'Proactively making changes to enhance plant production was pivotal. Though all the components in the existing systems were still operational, after over 10 years, efficiency had naturally declined by ~10%.

'We anticipate a 20% total power increase over the original output, as a direct result of these repowering efforts. In our view, all revamping efforts should adopt this proactive approach. We've been using Solis for the past four years, without any issues. Their products are great, and their service team is quick to respond to any queries.'

Looking ahead

The future of PV inverter repowering is promising, driven by ongoing technological innovations and the transition modernised energy systems. Continued advancements in inverter design, including energy storage integration, smart grid functionalities, and cybersecurity measures, as seen with guidance recently issued in the UK for 'smart-device' manufacturers, will further

optimize system performance and resilience. Repowering will play a pivotal role in enabling the integration of PV systems into microgrids and decentralized energy networks.

As the energy landscape evolves towards sustainability and grid modernization, repowering initiatives will facilitate the adoption of innovative business models and energy management strategies, empowering home and business-owners alike.

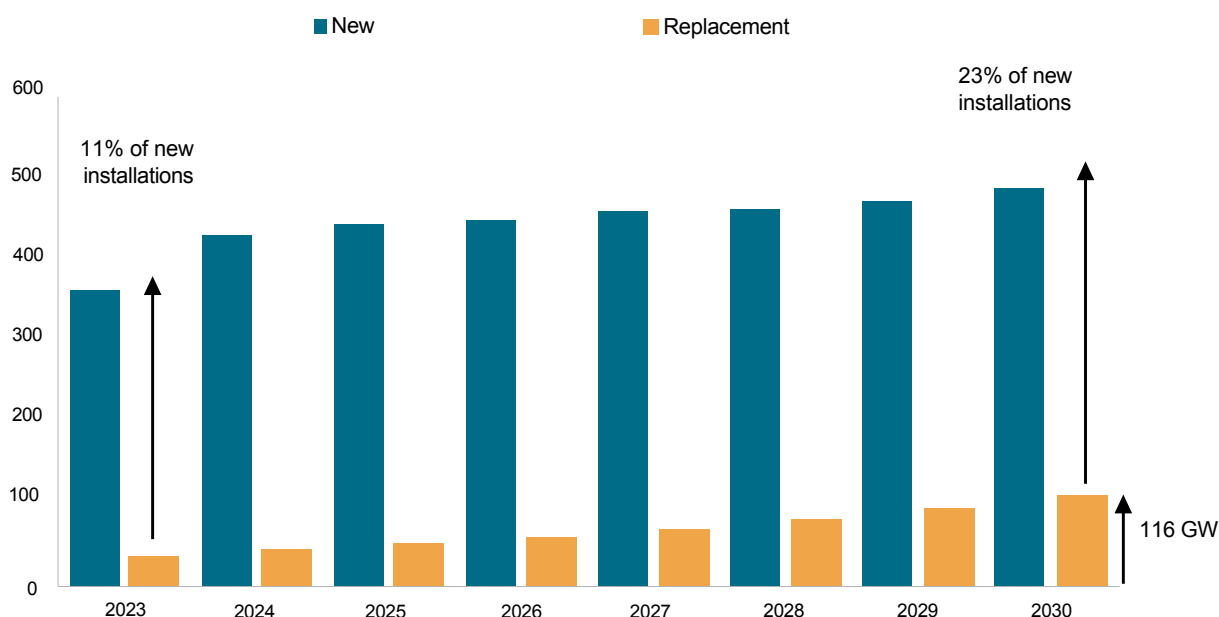
'As PV hardware ages, overall efficiency of the solar system can begin to drop. When the power output of the plant begins to consistently deviate from expected levels, it'll be time to consider repowering options,' comments Sandy Woodward, Solis' General Manager for Europe.

'We see repowering as an opportunity to enhance overall efficiency and save costs by integrating new technologies with existing infrastructure. When planning to expand PV plant capacity, incorporating repowering strategies will optimize performance and maximize returns.

'Solis offers a suite of solutions tailored for various repowering projects, and our experts support to design each solution to ensure customers derive maximum value from their PV systems. The goal of repowering isn't merely to restore system efficiency; it's to get more from your plant, whether that's greater savings or an enhanced user experience.

'Critically, when choosing an inverter manufacturer to partner with, seek a

Global demand for replacement PV inverters (GW)



Data compiled March 2024.
CAGR = compound annual growth rate, EMEA = Europe, the Middle East and Africa.
Source: S&P Global Commodity Insights.



manufacturer whose commitment extends beyond product selection. The market expects exceptional levels of technical service and support, from design and compatibility to installation and beyond. Our dedicated technicians throughout Europe offer hassle-free assistance when and where it's needed, in the local language. We truly believe it's this level of service that sets Solis apart in this industry.'

The long and the short of it? PV inverter repowering is a strategic approach to maximizing the performance, reliability, and sustainability of solar PV systems. By embracing technological advancements and upgrading aging inverters, system owners will unlock new opportunities and reduce operational costs, all while continuing their efforts to contribute to the global transition towards clean and renewable energy solutions.

Yes, challenges exist, but the growing demand for repowering solutions underscores its pivotal role in paving the way for a more resilient and sustainable future.

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