



The next solar challenge: making the installed base last

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The US solar industry has built an enormous fleet of operating assets. As that fleet ages, commissioning, preventive maintenance and timely repowering decisions are becoming increasingly important to long-term performance.

For much of the solar industry's growth, success has been measured in megawatts and gigawatts. How much capacity did we install? How quickly did we build it? How much more can we bring online next year?

Those questions still matter. But another is becoming increasingly important: how well will all that solar perform once it is built? This industry has built an enormous base of operating assets. As that base grows, it also ages.

That changes the conversation.

For developers, asset owners and operators, the next phase of solar is not simply about deployment. It is about protecting the performance of assets expected to operate for decades. That requires thinking about

service not simply as a response to component failure, but as part of the asset strategy from the outset of the project.

Start with the end in mind

A solar plant is built to generate energy and revenue for decades. But too often, decisions about how to support and maintain that investment are made later in the project lifecycle, sometimes only after an issue arises.

That is backwards.

The lifecycle strategy should begin during commissioning. Good commissioning does more than verify that equipment is functioning on the day a plant begins operation. It establishes a performance baseline, identifies potential issues and helps

ensure the system is operating as designed from the outset.

From that point, the focus then shifts to maintaining that performance.

Beyond commissioning, training is a significant part of the equation. Operators who understand the equipment they are managing are better positioned to recognize abnormalities, respond efficiently and know when additional support is needed.

Combined with preventive maintenance, that knowledge helps operators identify potential problems before they lead to failures that affect plant availability.

There is also value in spare-parts planning and availability, warranty strategy,

remote support, response times and access to qualified, certified technicians.

Individually, these may sound like service decisions. Collectively, they are proactive, asset-performance decisions.

Availability is an economic metric

When owners evaluate service, the conversation can easily become focused on cost. What does the maintenance agreement cost? What does an extended warranty cost? How much inventory should be held in spare parts?

The better question is what happens financially when the plant is not producing as planned.

An inverter represents only one part of a solar plant, but its performance has a direct relationship to the plant's ability to generate energy. When equipment is offline, the issue is not simply the cost of a repair. There can also be lost production, technician mobilization, troubleshooting time, parts availability and, depending on the project, contractual or revenue implications.

This is why the industry should approach service in terms of risk and lifecycle economics rather than individual transactions.

Long-term service agreements, for example, should not simply be viewed as extended warranties. At their best, they create a structure for managing performance risk over time. For asset owners, that can mean greater cost certainty, planned spare-parts availability, defined response expectations and faster recovery when failures occur.

There is another important benefit: continuity.

The longer your original partner remains engaged with an operating fleet, the more information is available to understand how equipment is performing in the field. That knowledge can inform maintenance planning, parts strategy and decisions about when an asset may need more significant intervention.

The goal is not to eliminate every possible failure. That is unrealistic for any power-generation asset. The goal is to reduce surprises and recover quickly when something does happen.

Service should change as the plant ages

A two-year-old solar plant and a 15-year-old solar plant should not necessarily have the same long-term service strategy.

Early in the asset life, the emphasis may be on commissioning, operator training, warranty support and establishing strong operating practices. As the plant matures, preventive maintenance, spare-parts availability and component condition become increasingly important.

Eventually, owners need to begin asking a different question: at what point does repairing aging equipment stop making economic sense?

That is where repowering enters the lifecycle conversation.

Repowering generally involves replacing or upgrading aging or unsupported inverters while preserving as much of the existing plant infrastructure as practical. It can become particularly important when equipment is reaching the end of its usable life, spare parts are becoming difficult to obtain or the original manufacturer no longer supports the product.

Too often, however, the first serious conversation about repowering happens after a failure.

By then, the owner may be making decisions under pressure while the plant is experiencing reduced production. Equipment compatibility must be evaluated. Engineering work has to

be completed. Procurement begins. Installation has to be scheduled.

What could have been a planned capital decision becomes an urgent operational problem. Earlier assessment gives owners more choices.

Repowering is an engineering decision before it is a purchasing decision

Replacing an aging inverter is not necessarily as simple as swapping one box for another.

A repowering assessment can include maximum power point (MPP) voltage and DC input current, module degradation over the life of the plant, output voltage, short-circuit current, transformer compatibility and the requirements of the existing installation. The economics also depend on the specific project.





That complexity is one reason owners sometimes delay the conversation. But repowering doesn't mean rebuilding the plant.

In many projects SMA evaluates, much of the existing AC and DC infrastructure can remain in place. Projects can also potentially be phased, allowing owners to spread capital requirements and installation work over time.

One example is the 16.6 MW Redcrest project in Edison, California, where the original inverter manufacturer had exited the market, leaving the owner with unsupported equipment and limited service options. The site was repowered with 10 SMA Sunny Central inverters, while the existing transformers were retained. This reduced installation complexity and helped limit downtime, demonstrating how repowering can extend the useful life of a plant without replacing all its infrastructure.

The objective should be to determine the point at which continued repair, declining availability, difficult-to-source parts and operational uncertainty outweigh the investment required to modernize the system.

That point will be different for every plant.

For some owners, extending a warranty and continuing preventive maintenance may make the most sense. Others may benefit from a long-term service agreement that

provides greater cost and performance certainty. Older plants may reach the point where repowering produces the stronger long-term economic case.

The important thing is having that conversation early, before the decision is forced by a failure.

The relationship should not end at commissioning

Historically, the solar industry has often been organized around individual stages of a project: development, engineering, procurement, construction, commissioning and operations. Once one stage is complete, responsibility moves to the next organization.

But the equipment itself doesn't experience the project that way.

What happens during commissioning affects operations. What happens during maintenance affects equipment life. Parts availability affects recovery time. Operating history affects decisions about warranty extensions and modernization. There is value in connection throughout many of those stages.

For SMA, supporting an asset throughout its operating life means moving beyond the traditional idea of selling equipment and responding when something breaks. It means helping customers commission plants

correctly, develop internal expertise through training, maintain equipment proactively, plan for parts and service needs and eventually understand when modernization makes economic sense.

That approach also creates accountability. The relationship after the sale becomes part of the value of the original technology decision.

Build for the long term, then operate that way

Solar has become a major part of the US power system. The industry should treat the assets already in the field accordingly.

The next measure of maturity will not simply be how quickly solar capacity grows. It will be how effectively the industry manages that capacity over 20, 25 or 30 years.

That means shifting from reactive service to lifecycle planning. Commission correctly. Train the people operating the equipment. Maintain it before problems become failures. Plan for parts and support. Understand the financial value of availability. And begin evaluating modernization before aging equipment becomes an emergency.

The best-performing solar plant is not simply the one that was built well. It is the one that is still performing well many years later.

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