

Beyond Cost Savings: How Smart Cable Design is Reshaping Utility-Scale Solar Efficiency



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The Efficiency Imperative in Utility-Scale Solar

For years, the utility-scale solar industry has focused on driving down costs as the primary strategy for improving project viability. While lowering material and labor costs remains essential, an emerging perspective is reshaping how developers, EPCs, and asset owners approach solar infrastructure: maximizing efficiency through smart system design. The role of cabling—often overlooked as a commodity—is proving to be a critical factor in enhancing long-term energy yield, reducing maintenance, and ultimately increasing project profitability.

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The Hidden Costs of Traditional Cable Design

Traditional cable selection and layout methods can introduce inefficiencies that may not be immediately visible but have long-term financial consequences. Voltage drop, for example, is one of the most significant factors impacting system performance. Poorly designed cable runs, incorrect conductor sizing, and excessive connections can lead to energy losses that add up over time.

Other considerations include:

Thermal and Mechanical Degradation: Prolonged exposure to high temperatures, UV radiation, and physical stress can accelerate wear, leading to higher failure rates and costly downtime.



Installation Inefficiencies: Manually assembling and routing single-strand cables can slow down deployment and increase labor costs, particularly in large-scale projects.

O&M Challenges: Systems lacking maintenance capabilities like easy access to string fusing, system disconnect consolidation, or poor cable management require more frequent manual inspections and reactive repairs.

Innovations in Cable Technology: More Than Just a Conduit

Advancements in cable technology and system architecture are helping utility-scale solar projects overcome these inefficiencies. Key innovations include:

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- **Pre-terminated Harness Assemblies**: These solutions significantly reduce installation time by eliminating field terminations, minimizing potential errors, and improving reliability.
- Advanced Bus Type DC Collection Systems: Integrating the use of bus type, DC collections systems greatly reduce system complexity, installation labor and failure points. At the same time, voltage drop issues are easier to mitigate and control.
- Harness Pre-fabrication and Packaging: Careful planning during the Harness design and close coordination with installation crews, can greatly reduce on-site construction labor while reducing laydown and storage space and packaging waste.

A Case for Strategic System Design

Optimizing system efficiency requires a shift from viewing cables as a simple connection medium to treating them as an integral component of energy delivery. Several best practices can help achieve this:

- **Optimized Routing and Layouts:** Reducing conductor lengths and optimizing string layouts can minimize voltage drop and power loss.
- 2 Consideration for higher energy modules and intelligent Trackers: As module energy output grows, so does voltage drop and other energy losses. Constant vigilance during the project preplanning, planning and final design must adapt to ever changing impacts related to module technology changes. Intelligent tracking designs developed to reduce hail and wind damage impact harness cable management due to increased tracker movement. Project designs must keep up with these constant tech improvements.

Conclusion: Rethinking the Value Equation in Solar Design

As utility-scale solar continues to evolve, it's time for the industry to expand its focus beyond material costs and recognize the critical role of cabling in overall project success. By investing in advanced cabling solutions and system design strategies, developers and EPCs can achieve greater efficiency, lower operational costs, and maximize long-term energy production. At Paige Renewable Energy, we are committed to engineering solutions that drive efficiency and reliability for utility-scale solar projects.

Contact us today to explore how smart cable design can enhance your project's performance and profitability.

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