envelio

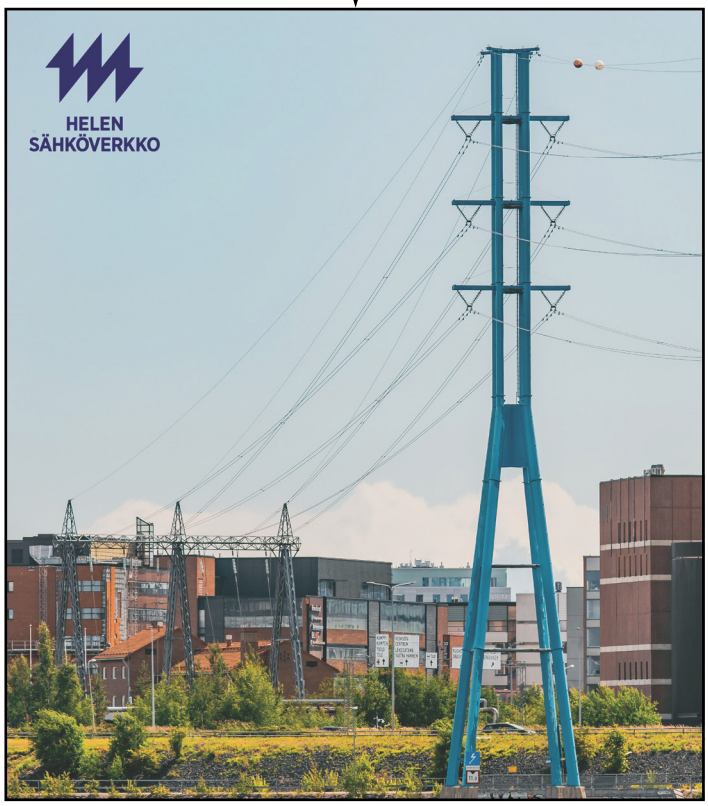
Scaling the Distribution Interconnection Process

White Paper | April 2025

Overview

After decades of flat demand, many utilities anticipate a significant increase in usage over the next 5-10 years.

Similarly, interconnections have surged, driven by the rapid growth of distributed energy resources (DER), which are energy sources that can be used to generate and store electricity. Most legacy systems are not built to support the increased volumes resulting in a pressing need for utilities to modernize.



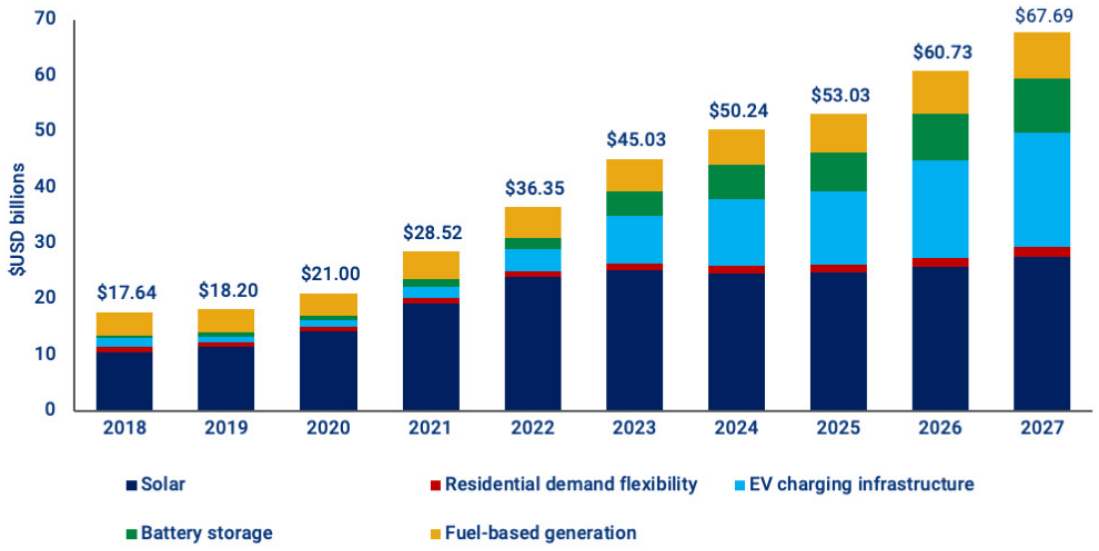
Helen Electricity Network; helen.fi

The Increase in Demand

After decades of flat demand, many utilities anticipate a significant increase in usage over the next 5-10 years. Similarly, interconnections have surged, driven by the rapid growth of distributed energy resources (DER), which are energy sources that can be used to generate and store electricity. This can include solar, wind, and storage.

Favorable federal and state-level policies, including the Inflation Reduction Act (IRA) and from the National Electric Vehicle Infrastructure (NEVI), are expected to accelerate the adoption. In addition, advancements in battery storage technology and the ability to quickly add grid capacity will drive market expansion. According to Wood Mackenzie (Wood Mackenzie Grid Edge, US Distributed Solar and Energy Storage Service), the DER market is projected to nearly double in capacity from 2022 to 2027, with capital expenditures reaching a staggering $67.69B USD from $36.35B USD.

The US DER market will nearly double from 2022 to 2027, reaching US$68 billion per year



Source: Wood Mackenzie Grid Edge, US Distributed Solar and Energy Storage Service

The Legay DER Interconnection Process

All interconnection requests and grid connected projects generally follow the following steps.

The steps are clear, but as request volumes grow, process inefficiencies become more apparent. Are applications complete, or do customers need to provide more information? Can engineering resources focus on the most complex cases instead of spending time on simpler requests?

Many utilities use digital application tools like PowerClerk by Clean Power Research to handle the general workflow. However, technical analyses remain largely manual, making it difficult to scale as request volumes and complexity increase.

- Preparing for each study is cumbersome, requiring extensive data pulls, model updates, data corrections, and integration of planned projects and queued applications
- Coordination across utility teams can lead to lost visibility into competing projects and missed synergies in analysis
- Managing the ever-changing queue and project lifecycle is challenging with manual updates
- Integrating data and results into downstream processes and systems is not feasible
- Simplified analysis for smaller projects, often relying on conservative estimates instead of load-flow modeling, can result in wasted capacity and significant issues for feeders near full utilization

With interconnection requests expected to rise, scaling these processes will only amplify existing inefficiencies.

- Limited resources lead to overworked staff, the need for additional hiring, or neglect of critical grid planning activities
- Increased processing times due to request complexity and overall grid utilization can impact customer service, regulatory compliance, and create risk of lost revenue and other financial penalties
- Reduced planning quality results in inefficiencies, missed opportunities, and cost challenges in grid management

Improvements to the DER Interconnection Process

As the adoption of Distributed Energy Resources (DERs) continues to grow, the process of analyzing and planning DER interconnections remains largely manual and fragmented.

Data and workflows are often spread across multiple systems and managed by different stakeholders, creating inefficiencies that hinder both customer satisfaction and utility performance. By modernizing the existing processes, utilities can unlock greater efficiencies, improve customer interactions, and better prepare for the future.

Enhancing Customer Value

Modernizing DER workflows can significantly enhance the customer experience by providing more streamlined and transparent processes. Key benefits include:

Real-Time Feedback for Decision-Making

- Customers can receive immediate insights to guide their early decision-making processes
- Utilities can reduce the need for extensive engineering studies for speculative customer requests

Siting Assistance for Targeted Requests

- Advanced siting tools can direct customers to more optimal locations for DER integration
- Encouraging strategic siting fosters more valuable interactions between utility engineers and customers, leading to more efficient project approvals

Improving Operations and Management

Automation and enhanced data integration can drive significant improvements in utility operations, leading to more efficient DER interconnection processes:

Automated Model Validation and Preparation

- Ensures that queued projects are automatically considered in system studies, reducing errors and inefficiencies.

Automated Technical Review

- Full load flow analysis can be conducted automatically, accelerating the review process.
- Small-scale requests can be fully automated, expediting approvals.
- Large-scale requests can benefit from partial automation, allowing engineers to focus on higher-value tasks that require expert analysis. Overall, this will improve customer interactions and optimize valuable engineering resources.

Preparing for the Future

To ensure sustainable and scalable DER integration, utilities must embrace a more connected and adaptable ecosystem. Key modernization strategies include:

Seamless Integration Between Applications and Models

- Enhanced interoperability between different software tools ensures a more efficient analysis process.
- Model updates can be performed in real time, improving responsiveness to customer inquiries and regulatory requirements.

Advanced Scenario Planning

- Leveraging real-time, integrated data allows utilities to explore a wide range of future scenarios.
- Dynamic modeling capabilities enable utilities to optimize system planning, ensuring resilience and reliability in an evolving energy landscape.

Conclusion

Modernizing distributed energy resource workflows is critical for transforming today's fragmented and manual systems into efficient, customer-centric solutions. Through strategic automation, enhanced integration, and real-time data utilization, utilities can deliver greater value to both customers and the grid itself. The time is now to evaluate options.

About envelio

envelio provides a collaborative software platform to utilities and grid operators that enables data orchestration, holistic planning, and advanced simulations. Through data-driven decision making and automation, utilities can drive shorter interconnection queues, reliable operations and intelligent grid investments.

The envelio Intelligent Grid Platform is already used by 70+ utilities globally.

Luisa Kröger

Senior PM Innovation
envelio GmbH

Juliane Bednarz

Principal Customer Success Manager
envelio GmbH

www.envelio.com