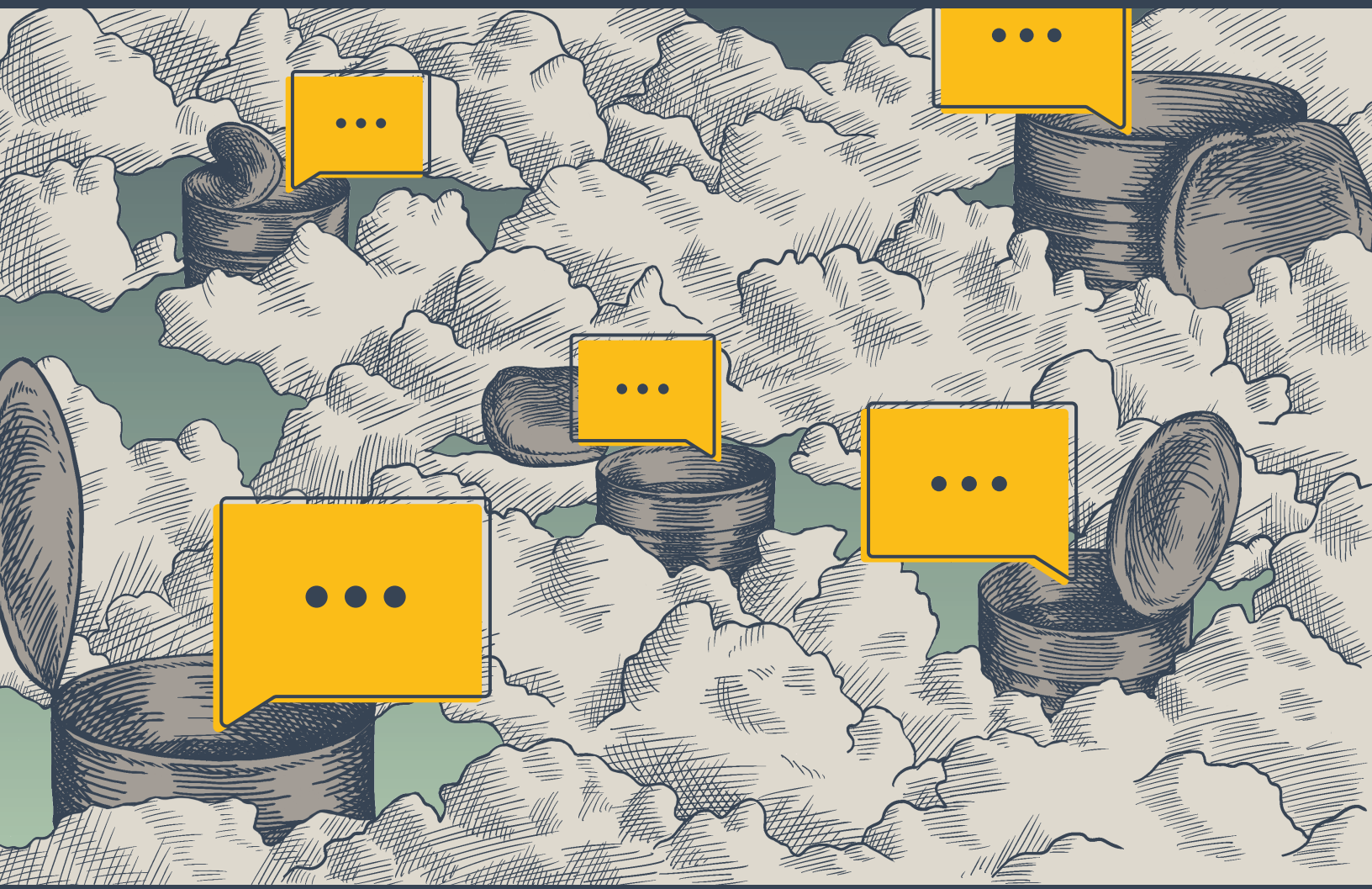
simple thread | MINERVA™ INTERCONNECT

Flying Blind:
How Old Assumptions and Canned Answers Are Killing Interconnection Projects

By Simple Thread | 2026



simplethread.com | 2400 Old Brick Rd, Suite 114, Glen Allen, VA 23060 | 877.893.5486

WELCOME

What's Inside

This whitepaper is built around *two fundamental problems* every developer in today's interconnection queue is facing, but many aren't aware:

1 The Queue Is Not What It Used to Be

Why the financial stakes have fundamentally changed and what the data actually shows.

2 The Intelligence Problem

Why having access to data is not the same as having good data, or an edge.

We then look at how developers are ***changing their tactics*** to approach today's grid in a different way, and ***what is actually working***.

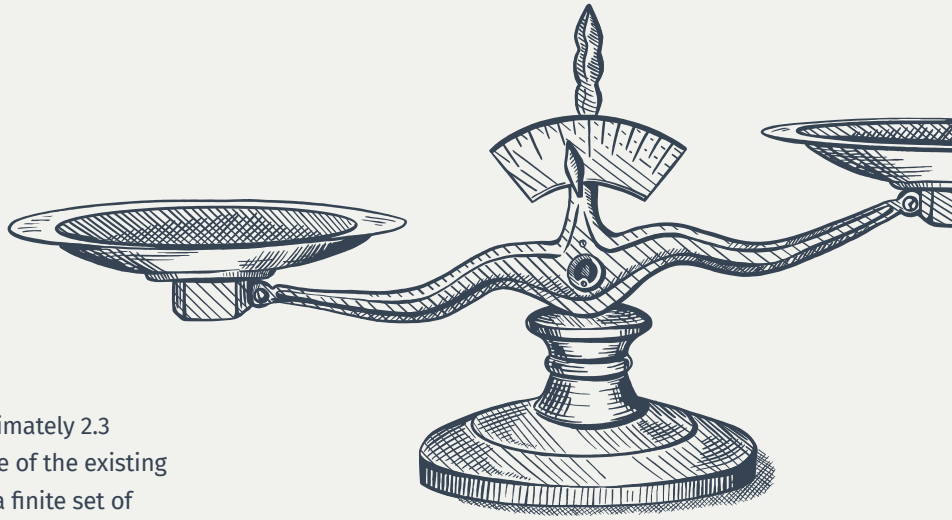
And finally, we have a ***self-assessment for your team*** to better understand if you're lacking the visibility you need in order to manage your projects effectively.

SECTION 1

The Queue Is Not What It Used to Be

The Scale Has Changed

A decade ago, interconnection was a technical hurdle. Today it is the defining financial and strategic risk in renewable energy development.

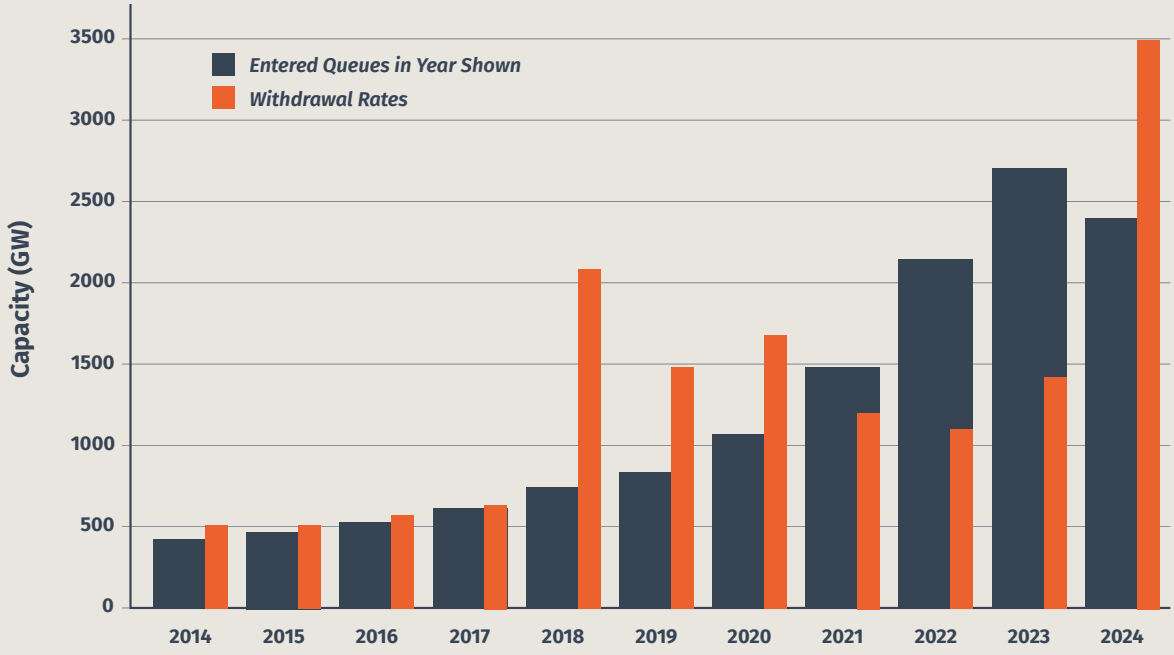


The U.S. interconnection queue has grown to approximately 2.3 terawatts of capacity. That is more than twice the size of the existing generation fleet. Every project in it is competing for a finite set of viable points of interconnection against a queue that is constantly shifting and is clogged with unviable projects.

The consequences are not theoretical.

- **Network upgrade costs** that once could be estimated at study entry **now arrive as massive surprises late in the process**, sometimes exceeding the cost of building the project itself.
- **Study timelines now average nearly 5 years nationally**, creating enormous carrying cost and timeline risk for developers.
- **Stricter first-ready, first-served rules** implemented to clear the backlog **have changed the competitive dynamics** of early queue positioning.
- **ISOs are increasing initial deposits** to discourage speculative submissions, meaning **every queue entry is now a committed financial position**, not a low-cost option on a future project.

Queue Size and Withdrawal Rate



Two regulatory developments have sharpened these stakes considerably. FERC Order 2023's shift to first-ready, first-served means entering the queue now requires massive, at-risk commercial readiness deposits. And Order 2023 is not the endpoint. Regional operators like CAISO and SPP are continuing to reshape their interconnection processes in ways that can change the competitive dynamics of a given market with little warning.

This is why flying blind is a financial disaster today.

The DOE ANOPR reinforces the importance of having visibility into everything happening in a particular area. If you are trying to interconnect a generation project, situational awareness across the full regional picture is not optional.

The Withdrawal Rate Tells the Story

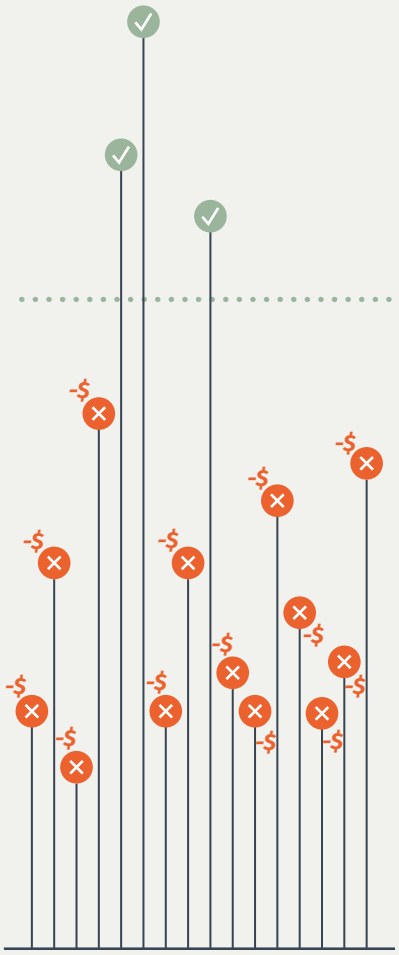
Approximately 77 percent of capacity that entered interconnection queues between 2000 and 2019 had withdrawn by the end of 2024, with more than 700 gigawatts of capacity withdrawing in 2024 alone.

The reasons are specific and they matter:

- Extremely high and unexpected **network upgrade costs** discovered late in the study process.
- **Study delays** now averaging nearly 5 years nationally, far beyond what most project finance models can absorb.
- Stricter **first-ready, first-served rules** that disadvantage developers who entered without adequate preparation.

Only an estimated **13 percent** of queued projects are projected to reach commercial operation. If 87 percent of projects stall or fail before completion, the financial exposure across the market is enormous, even before counting explicit cost tallies.

9 out of 10 projects in the current queue will never be built. Which side will you fall on?



In PJM alone, interconnection costs rose from roughly $29 per kilowatt to over $240 per kilowatt between 2020 and 2022. Worst-case examples have exceeded $1,000 per kilowatt. Each project that withdraws carries study fees, deposits, engineering costs, and typically increased upgrade obligations before exit. PJM currently has roughly 130 GW of capacity-eligible projects sitting in its interconnection queue unable to connect, equal to 73 percent of the capacity that cleared the 2026/27 auction. The result is a capacity shortage that generated $16.1 billion in total system costs in PJM's most recent capacity auction alone.

The financial exposure is rarely visible at entry. A typical developer enters the queue with a cost estimate based on preliminary data, only to receive a late-stage facility study showing interconnection costs that exceed 10 percent of the project's total capital expenditure. At that threshold, project economics collapse. The developer withdraws, forfeiting permitting fees, land options, and milestone deposits already paid.

In PJM, withdrawn projects face average interconnection costs of $671 per kilowatt. For a standard 100 MW project, that is more than $60 million in exposure.

Better data changes the outcome at two specific moments. ***The first is site selection***, when the developer is choosing a POI. Tools that reflect current queue status and allow rapid scenario analysis against real withdrawal probabilities let developers make that initial decision on current data rather than outdated heat maps.
The second is the cluster study phase decision, when the developer must decide whether to proceed, downsize, or withdraw. At that moment the work is stress-testing assumptions across the range of possible cluster outcomes, from best case to worst case, and making the most defensible decision with the information available.

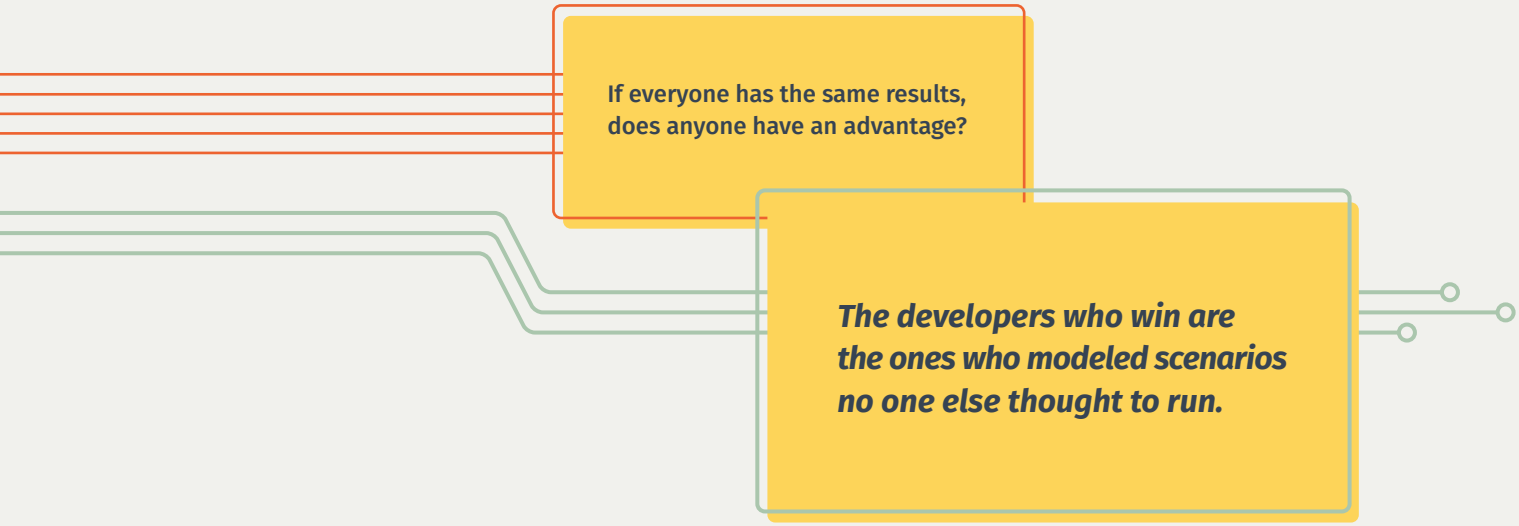
SECTION 2

The Intelligence Problem

It Is Not About Old Data. It Is About Canned Answers.

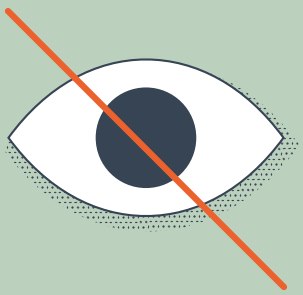
A common assumption in the industry is that the solution to interconnection uncertainty is better, more current data. The real problem runs deeper than that.

Most developers using modern tools are not working with outdated information. They are working with the same information as everyone else. When every player in the queue uses the same tools and receives the same standardized outputs, no one has an analytical edge. Everyone is making capital decisions from an identical map.



The Two Failure Modes

The developers most at risk fall into one of two categories:



1 Not watching at all.

Many developers make a submission and then fail to actively monitor how queue dynamics are shifting around their project.

A competitor withdrawal that would have made their POI substantially more viable goes unnoticed. Or the reverse: changes within and around the cluster, including regulatory interventions and withdrawal-triggered cost shifts, can raise projected upgrade costs in ways the developer finds out in a restudy rather than in time to act. The issue is not access. Anyone can get access to queue information today. It is that most are not watching it in a way that tells them when their own project assumptions have changed.



2 Relying on canned outputs.

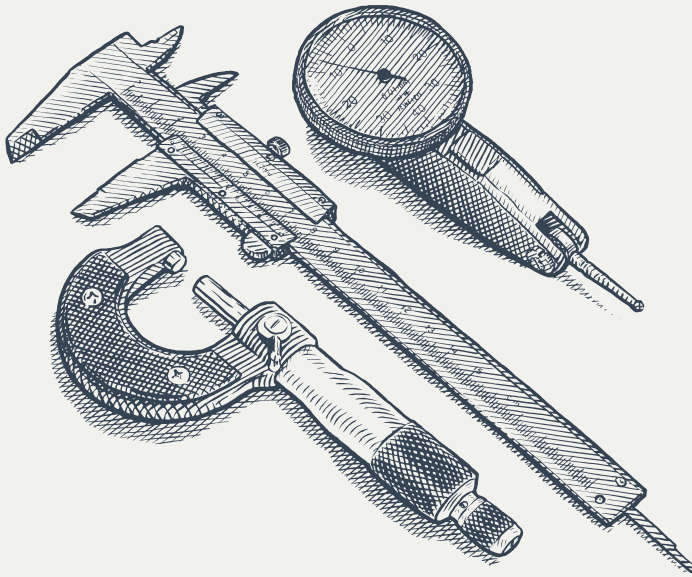
There is limited or no ability to change assumptions in most tools, leaving developers with nothing but canned answers and no proprietary insight.

It is not just about queue changes. It is about being able to develop and reflect your own thesis against the projects in the queue. The tool's output looks the same as everyone else's. When every developer is looking at the same map, no one has a competitive edge.

The Expertise Gap

There is a third compounding factor: the assumption that modern interconnection tools are a replacement for technical expertise. Vendors frequently market to finance teams and non-technical executives with the promise that anyone can use this.

This is dangerous. The answers you can get without transmission planning expertise are not wrong. They are simply not nuanced enough to bet serious capital on. ***Interconnection is no longer a search problem, it is a modeling problem.*** It requires engineers who understand the grid, the rules of the specific ISO or RTO, and the dynamics of the queue around a given project.



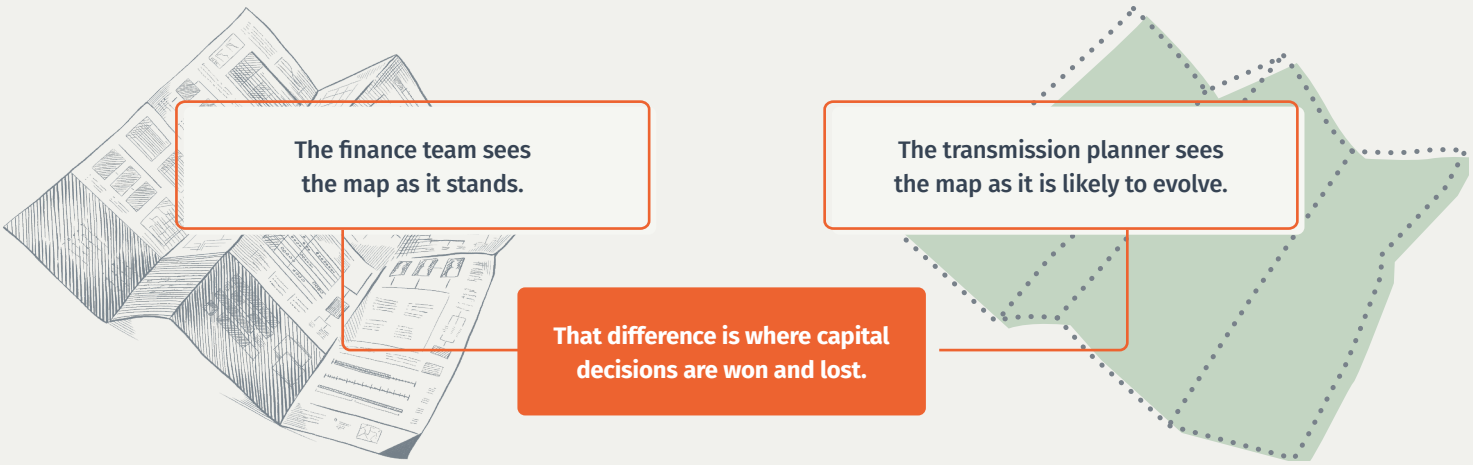
"Teams without access to transmission planning expertise" are flying blind. Our goal is to provide a platform that puts that expertise, whether in-house or through Simple Thread, to work at scale.

Consider a team using one of the standard tools on the market. They hand it to their finance department, who pulls up a regional view and sees nothing but overloaded POIs. What the tool cannot tell them is that several of the projects creating that congestion are approaching a phase transition they are unlikely to survive. Their cost-per-size metrics put them above the threshold where withdrawal becomes near-certain. Factor those out, and the capacity picture changes substantially.

There are other blind spots the map does not show. Transmission planning projects driven by reliability needs, including end-of-life line rebuilds using new conductor standards, routinely unlock additional capacity that does not appear in current queue data. Large load additions including data centers and industrial facilities change network flows across the entire region. A POI that looks unviable today may be the right call if any of those projects materialize.

SECTION 3

What Real Interconnection Intelligence Looks Like



From Shared Results to Your Own Scenarios

Real interconnection intelligence is not a dashboard. It is the capacity to answer specific questions about specific projects, modeled against the actual queue as it stands today, not as it was when a study was last run.

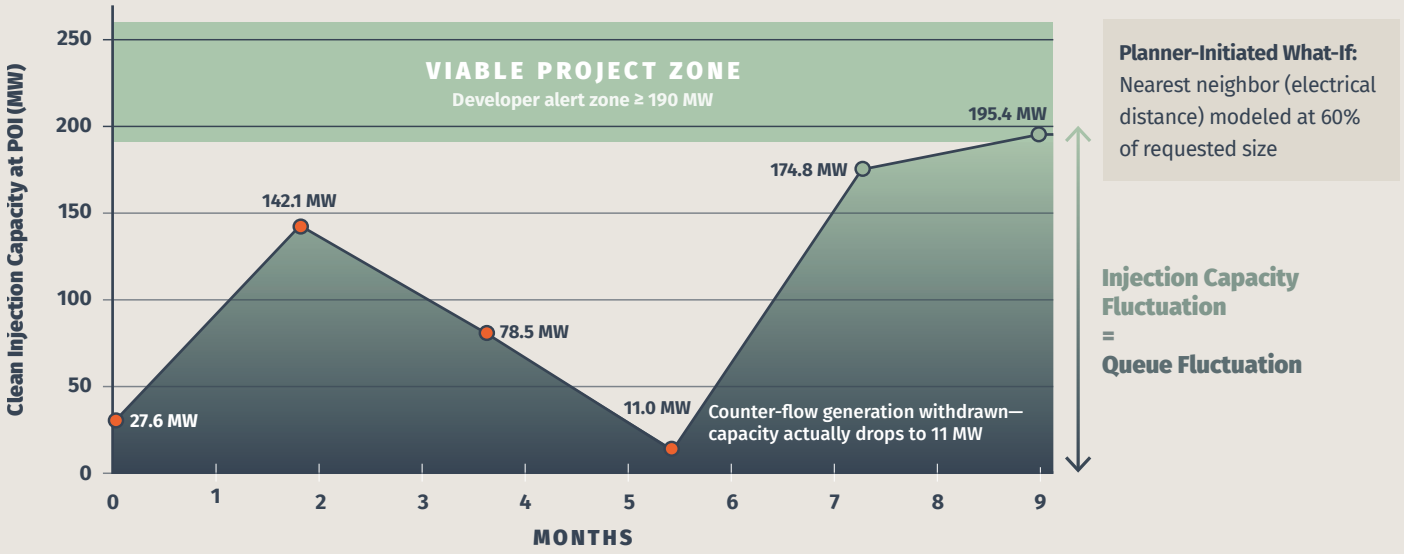
The critical shift is from consuming shared results to producing your own.

Here is what that looks like in practice:

- **Running your own scenarios:** What happens to my project's upgrade cost exposure if three other projects in my cluster withdraw? What if two new large-loads are planned in the same area? These are the questions that change decisions, and they cannot be answered with canned outputs.
- **Monitoring for inflection points:** Minerva's automated study updates allow teams to track the precise moment when a project's viability changes, not discover it in a surprise restudy months later.
- **Multiplying engineering throughput:** Engineers using Minerva can run many more scenario analyses than they could manually. A lean team of two or three engineers can operate with the analytical depth of a much larger planning organization.

Project Beacon POI — automated transfer-limit monitoring

Nine months of Minerva-triggered re-studies as the surrounding queue evolves



Illustrative Scenario

Consider a developer scouting a 200 MW solar site at a single 230 kV point of interconnection in one of the most active generation interconnection markets in the country. The initial transfer-limit study is unforgiving: 27.6 MW of clean injection capacity, and roughly $266 million of cumulative network upgrade obligations required to clear 200 MW. On a standard heat map this POI is unviable, and most developers would cross it off. Instead, this one asks Minerva to monitor it — alert on clean injection capacity above 190 MW — and walks away.

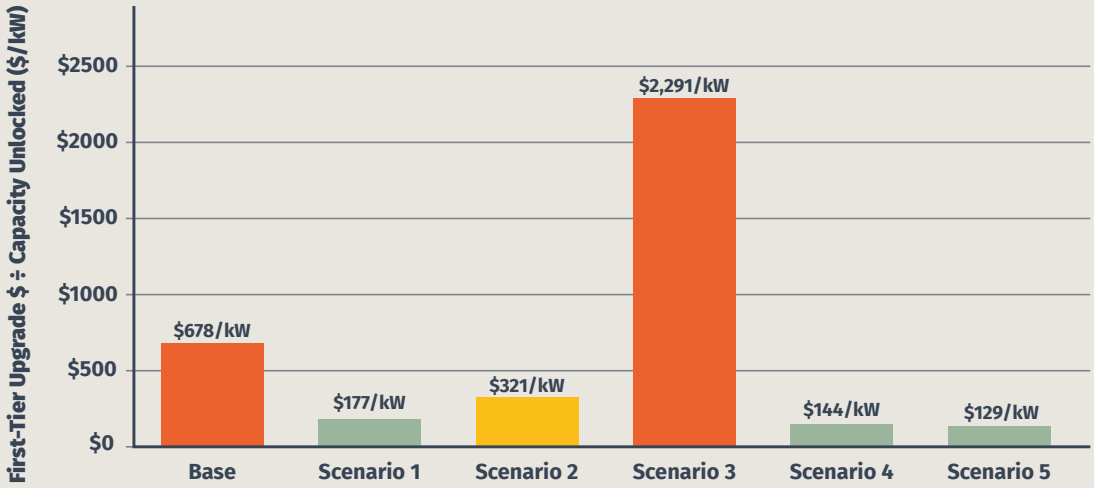
Over the next nine months, Minerva's daily queue sync triggers a fresh transfer-limit re-run every time a competing project withdraws or restudies, with no human in the loop. The simulated capacity climbs to 142 MW, falls to 78 MW, then collapses to 11 MW after three competitor withdrawals — the kind of "good news" event a withdrawal feed or a static heat map would have read as opportunity, but which the simulation reveals as the moment two counter-flow injections disappear and a previously-masked contingency becomes binding. Capacity recovers to 175 MW and stalls there, just short of the threshold, even as competitor withdrawals continue.

At that point the planner does something a canned tool simply does not permit: she opens Minerva and asks a different question — not "who else has to withdraw?" but "which neighbor, if downsized, would tip this POI past 190 MW?" Minerva ranks the active queue by its proprietary electrical-distance metric — proximity measured in network impedance, not on a map — and identifies the single closest project. The planner models that project at 60% of its requested size, and simulated capacity jumps to 195.4 MW. The cost of capacity at the same physical POI has fallen from $678/kW at baseline to $129/kW — without changing the project, the location, or the configuration. The only things that changed were the queue around them, and the willingness to model the scenarios no one else thought to run.

Effective Unit Cost of Capacity at First Tier Upgrade

From unfinanceable to viable — driven entirely by queue evolution, not by changing the project.

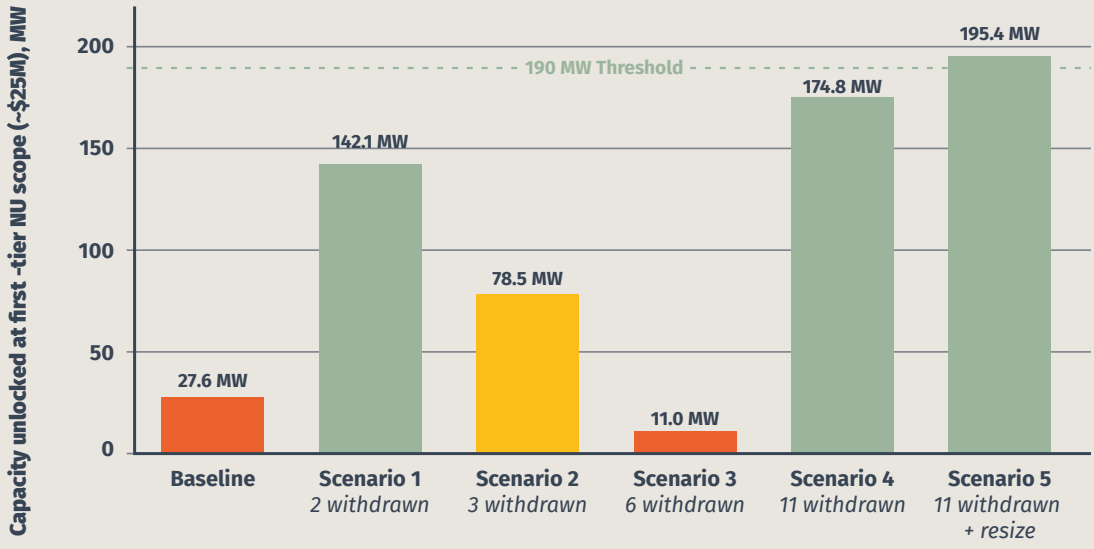
A single project, under different scenarios, results in wildly different $/kW costs



Same POI, Same Upgrade Scope, Different Queue States

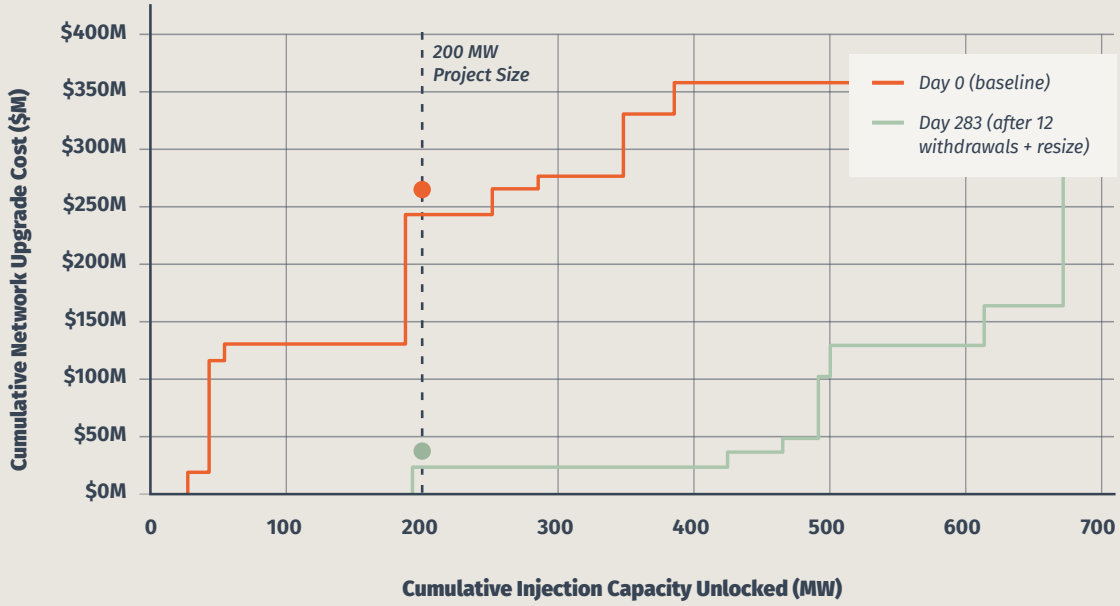
Each bar is one Minerva re-study triggered by queue changes since baseline

The same project, when monitored over time with a changing queue, results in huge swings in available headroom.



Cost-to-Unlock Curve at Project Beacon POI

The cost curve for Project Beacon showing the additional investment required to unlock more than 190 MW. Each step rebuilds the next most-limiting facility. ***Lower & flatter = better project economics.***



Creative Engineering as Competitive Advantage

POIs with headroom are no longer abundant. The developers who consistently find the best POIs are not simply the ones watching the queue most closely. They are the ones applying creative engineering to find points of interconnection that others have not thought to model.

This is not luck. It is the result of running exploratory, what-if scenarios that most teams never attempt because the tools they use make it too slow or too expensive. When scenario runs carry no credit limits and results come back quickly, engineers start asking different questions. They model configurations that fall outside the obvious search area. They find opportunities before anyone else realizes they exist.

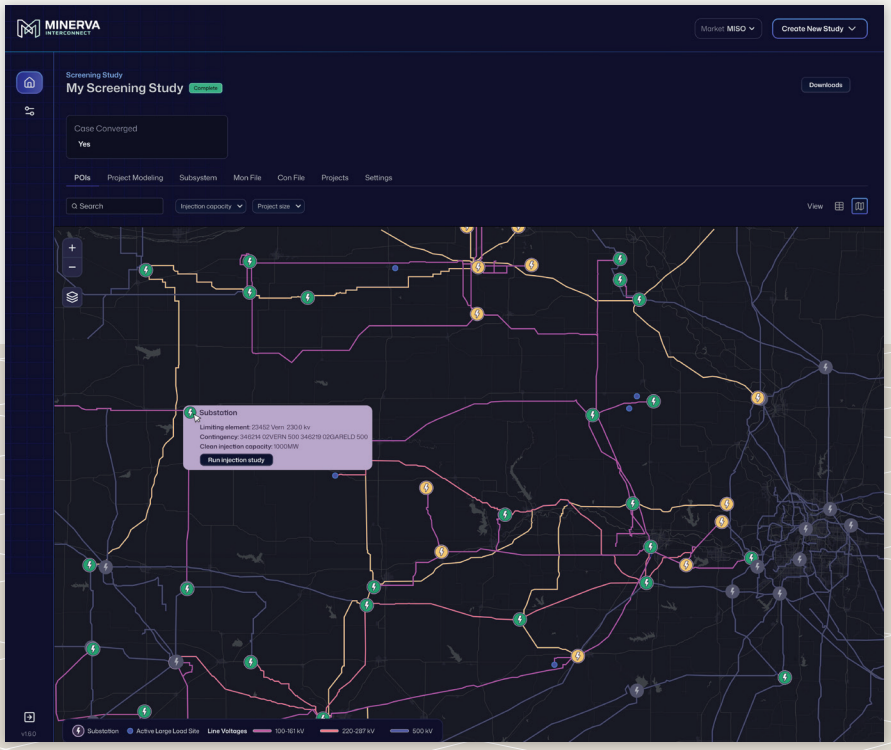
The best POIs are not found on a heat map. They are found by engineers bold enough to run scenarios others don't think to model. Minerva gives your team the capacity to be those engineers.

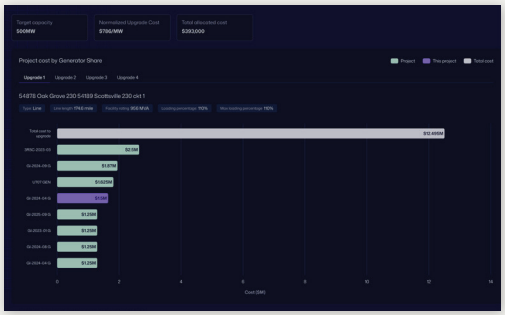
The Minerva Model

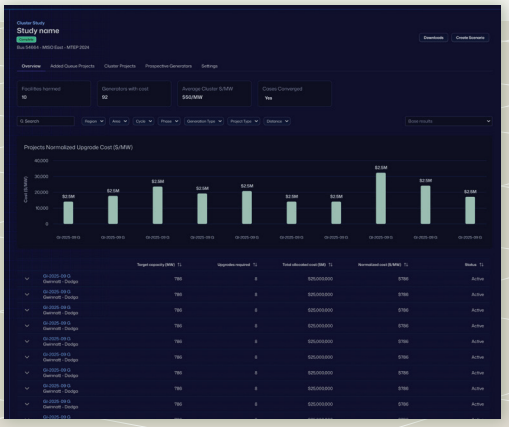
Minerva Interconnect™ is a cloud-based SaaS platform built on a Model on Demand (MOD) engine. Unlike tools that return pre-built outputs, Minerva allows users to construct up-to-date study models incorporating the latest queue changes in real time. Every scenario is built from your projects and inputs, not canned scenarios.

Key Capabilities

- Unlimited scenario runs with no credit limits. This is what makes exploratory engineering economically viable for any size team.
- In-queue analysis aligned with RTO/ISO process and rules, evaluating combined impacts and shared constraints across multiple interconnection requests.
- Contingency and withdrawal simulation: model what-if scenarios and see immediately how your project's cost exposure changes.
- Visual, defensible outputs with full traceability, so results can be explained to investors, boards, and lenders.







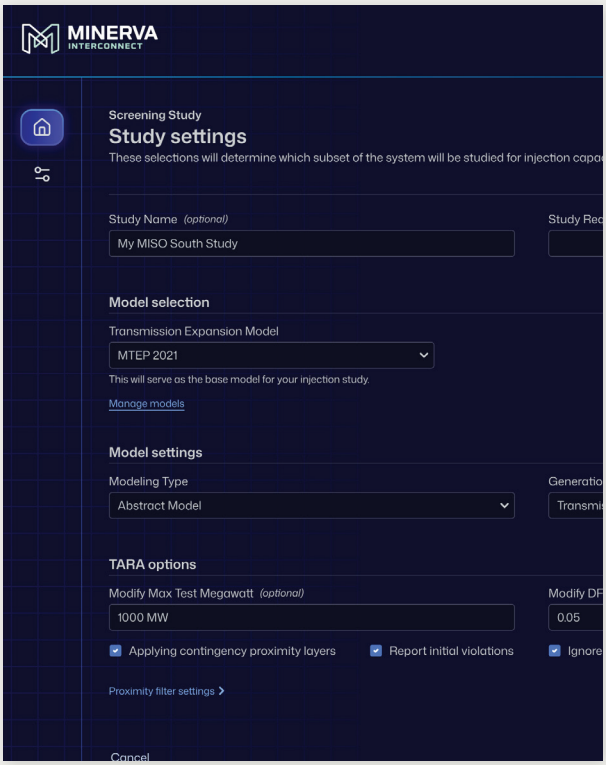
Expertise-as-a-Service

Minerva is designed to amplify engineering expertise, not replace it. For many teams, the hardest part is not using the tool. It is knowing what to do with it first. For teams without that expertise on staff, the gap between having access to Minerva and getting real value from it is exactly where Simple Thread's transmission planning experts come in.

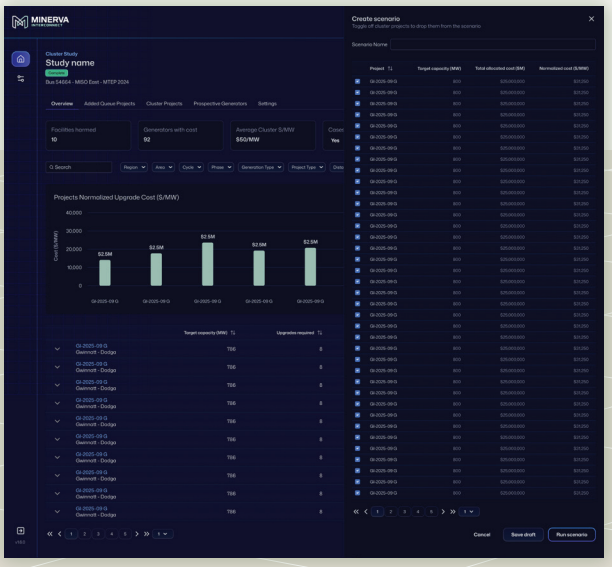
The real challenge for most developers is formulating their view of the market: where to focus, which regions to prioritize, what thesis gives their organization a genuine competitive edge in the interconnection queue. That strategic foundation is what separates teams that extract real value from Minerva versus teams that use it as a fancier version of what they already had.

Simple Thread's transmission planning experts work with our partners to build that foundation. Once the thesis is in place and the team understands how to apply creative engineering through the platform, they can run with the tool themselves. This is the "get you going" model, and it is the most direct path to getting real value out of Minerva quickly.

A single engineer with Minerva and a clearly defined thesis can do the scenario work that previously required a team of senior planners. A small team with Minerva can compete with the modeling depth of a much larger organization.







SECTION 4

Are You Flying Blind? A Self-Assessment

Answer the following questions honestly.

If you answer No to two or more, your team is making significant capital commitments without the intelligence needed to protect them.

Question	Yes	No
Are you actively monitoring how prior-queue project activity is changing the upgrade cost exposure for your active projects?	☐	☐
Can you model what happens to your POI's viability if the top three projects ahead of you in the cluster withdraw?	☐	☐
Is your team running its own scenario analyses, or consuming standardized outputs that look the same as what your competitors are seeing?	☐	☐
Do you have transmission planning expertise in the room when interconnection decisions are made?	☐	☐
Would you know within 48 hours if a queue change materially affected one of your active projects?	☐	☐
Does your team have a defined thesis about where and how to find POIs that others haven't identified?	☐	☐

The Next Move

The interconnection queue will not get easier.

Energy demand is accelerating from data centers, electrification, and industrial expansion. Regulatory complexity is compounding. The $16.1 billion in system costs generated by PJM's most recent capacity auction is not an abstract market statistic. It is the financial consequence of 130 GW of capacity sitting unable to connect.

The developers who reach commercial operation are not the ones with the deepest pockets. They are the ones who commit capital at the right moments, to the right projects, with real intelligence backing the decision.

Minerva Interconnect™ was built for this environment.

Not to sideline engineers, but to amplify what the best ones can do. The platform gives your team the ability to get answers that don't look like everyone else's, find POIs that others haven't seen, and monitor the queue with the kind of active discipline that turns visibility into a genuine competitive advantage.

Ready to see Minerva in action?

If your team is ready to stop flying blind, we would like to show you how to build your edge in the interconnection queue.

MINERVA™ INTERCONNECT

hello@simplethread.com | 877.893.5486 | simplethread.com