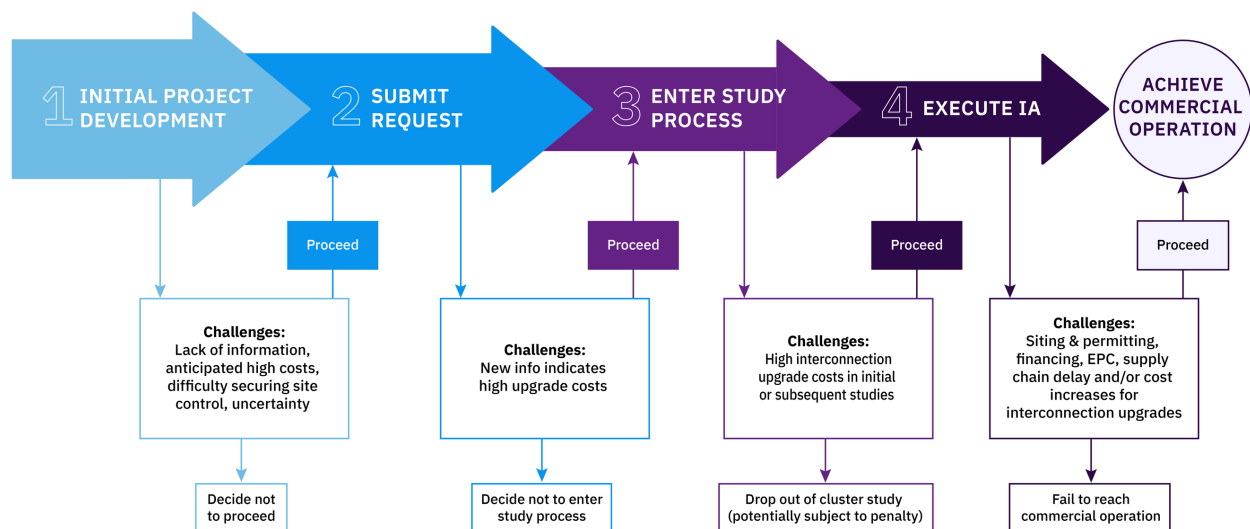


Moving Through the Interconnection Queue: How a Project Gets Built—or Doesn't

Across the country, over 2,000 gigawatts of resources representing 10,000 projects are waiting for the green light to connect to the grid so they can commence construction and start operating—mostly clean resources like wind, solar, battery storage, and hybrid renewable-plus-storage projects. These projects are stuck in *interconnection queues*, undergoing an evaluation of reliability impacts and transmission system upgrades that must be made before they can start to deliver electricity to the grid.

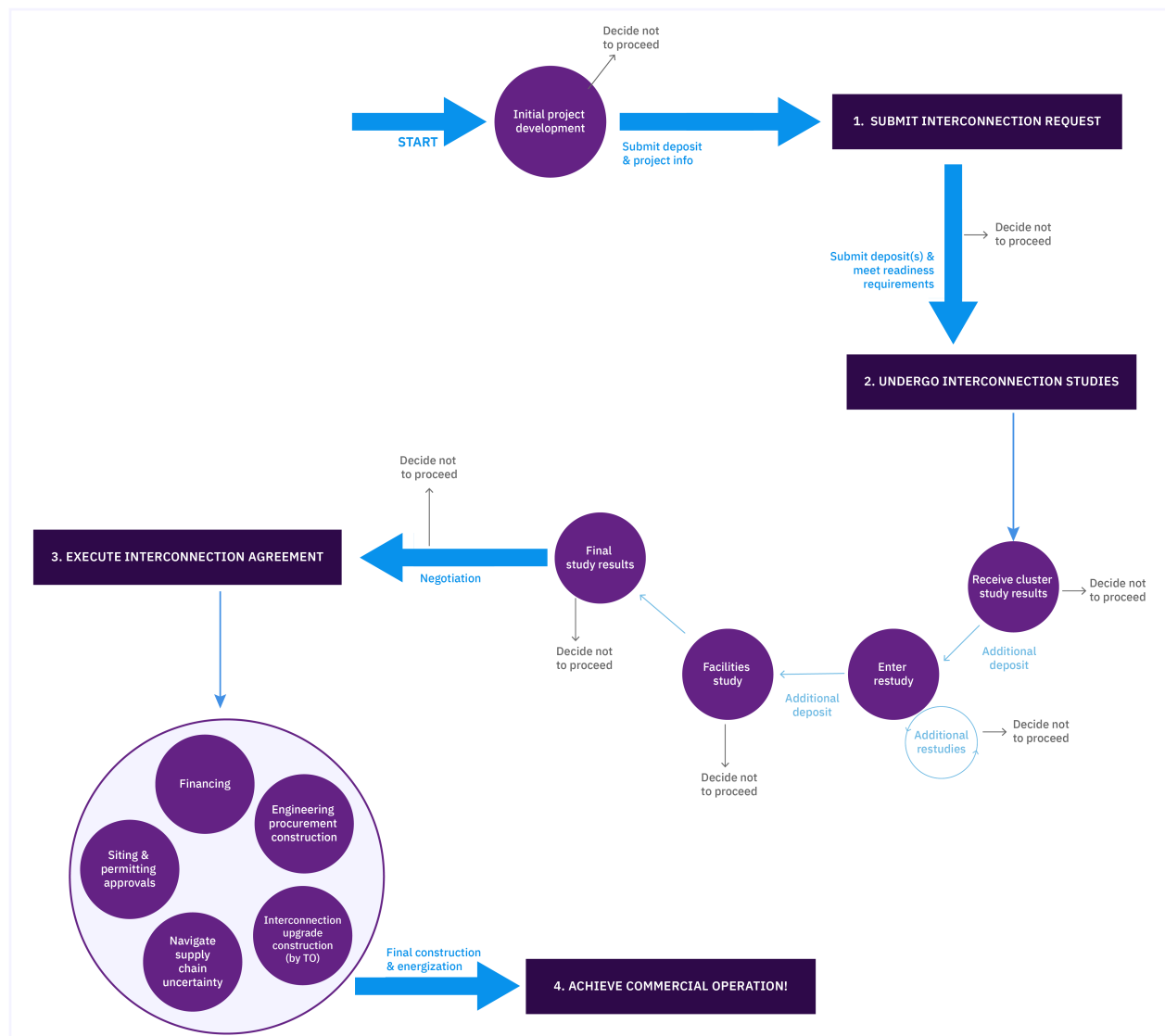
The interconnection process is a complex, multi-step, multi-year journey that many projects don't make it through. While necessary, the interconnection process is widely acknowledged to be broken, with everyone from the Federal Energy Regulatory Commission (FERC) to utilities and grid operators to project developers calling for and working toward reform. For projects trying to get built, the cost and schedule uncertainty of the interconnection process makes all the other parts of the development process—from financing to permitting—much more challenging.

The following guide walks through the process from the perspective of a project developer, highlighting challenges faced along the way and explaining why some projects don't make it to commercial operation. While the process is different in every region, this guide outlines the general trajectory any project takes to connect to the grid, reflecting reforms finalized by FERC in Order No. 2023 issued in July 2023, but not yet implemented. The guide explains the role of the project developer; the transmission provider, i.e., the Regional Transmission Organization or Independent System Operator (RTO/ISO), or the utility in non-RTO/ISO regions; and the transmission owner (in RTO/ISO regions where the transmission owner is not also the transmission operator).



How Interconnection Backlogs Impact the Grid and Customers

While interconnection costs and delays are directly borne by developers seeking to connect new projects to the grid, the impacts of these costs and delays are ultimately felt by the grid and the customers it serves. As FERC unanimously recognized in Order No. 2023, delays and cost increases in the interconnection process impact grid reliability, with multiple regions currently cautioning that delays to new resources coming online is a threat to reliability. At the same time, the current interconnection process results in higher costs for consumers due to higher project development expenses that are ultimately reflected in energy prices, inefficient transmission buildout, and lack of efficient market entry of new resources that undermines competition.



1. Submit an Interconnection Request

What it involves:

The first official step in the interconnection process is for a project developer to submit an interconnection request, a non-refundable \$5,000 deposit, and a refundable study deposit ranging from \$35,000 to \$250,000 to the transmission provider.

Who does what:



Project developer: Before submitting an application, a developer devotes significant time and resources to the potential project, including conducting its own evaluation of the viability of the proposed point of interconnection (based on limited information available from transmission providers about the grid conditions and anticipated upgrades), developing and providing significant technical information about the project, securing sufficient control of the proposed project site (“site control”) to meet “readiness” requirements intended to verify the project’s viability, and, depending on the transmission provider, taking other steps to demonstrate project viability.



Transmission provider: Sets the requirements for the interconnection request and reviews materials for completion. FERC Order No. 2023 requires transmission provider to engage with project sponsors during a 60-day window as developers determine whether to move forward to the interconnection study.



Transmission owner (if different than transmission provider): No formal role in the interconnection request and pre-study engagement process, but often relied upon to provide information to inform an interconnection application and decision to proceed.

Challenges and Potential Points of Failure:

- **Lack of sufficient transmission headroom** to accommodate new projects at reasonable cost means that many otherwise viable projects entering the queue will ultimately drop out.
- **Lack of publicly available information about transmission capacity** makes it difficult to gauge a project’s viability when entering the queue, and uncertainty in the process ahead means some projects that go forward based on best information and assumptions will ultimately face interconnection costs that make them unviable. Order No. 2023 requires public posting of some information relevant to



interconnection opportunities as a tool to help alleviate this challenge, but developers will still be operating with limited insight into likely upgrade needs and costs, which depend not only on grid conditions but also other projects seeking to interconnect.

- **Some projects may have difficulty meeting “commercial readiness” requirements** (e.g., demonstration of site control) at the time of the interconnection request, especially given the long duration and uncertainty of the interconnection process ahead. Order No. 2023 requires developers to have some form of contract or arrangement in place for 90% of land required for the proposed project at the time of interconnection.

2. Undergo Interconnection Studies

What it involves:

The interconnection study process involves a sequential series of studies. At each stage, the developer receives more granular, updated cost and timeline information, and must decide whether to continue to proceed through the queue. Projects that move forward owe additional deposits and must meet a ratcheting series of milestone requirements (e.g., demonstrating increased control of the proposed project site). Projects that withdraw face penalties, which increase as they proceed through the queue, intended to discourage late dropouts that impact the study results and costs assigned to other projects moving through the queue. FERC’s Order No. 2023 requires that all projects be studied in *clusters*, meaning that the collective impact and necessary upgrades for a group of projects is studied together and the cost of any shared upgrades is allocated across projects according to the “proportional impact” each project has on the need for a particular upgrade. Order No. 2023 also sets forward milestone requirements and deposit amounts that will apply in all regions.

Who does what:



Project developer: Pays study deposits and meets milestone requirements for each study phase (or decides to drop out of the queue) and provides additional technical information about the project. Developers generally have a short window of time (Order No. 2023 allows 30 calendar days) between receiving the study results and providing required deposits and information to remain in the queue. As the project moves through the process, a greater portion of the deposits provided are “at risk” and will not be returned if the project drops out.





Transmission provider: Collects deposits and milestone proof/deposits, conducts studies, and delivers reports to project developer.



Transmission owner (if different than transmission provider): Provides non-binding “good faith” estimates of interconnection upgrade costs and timelines.

Challenges and Potential Points of Failure:

- **Projects are often assigned far-away, deep network upgrades** that can make a project unviable. These network upgrades result from engineering parameters that generally set a low threshold to determine whether a project is “triggering” an upgrade need, assume worst-case operating conditions, and do not allow for any re-dispatch or curtailment, even in many cases for projects that are not requesting or receiving full deliverability (i.e., projects are paying for a higher level of grid access than they actually receive).
- **“Participant funding”** means that projects generally pay the full cost of any identified upgrades, even though in many cases these transmission investments benefit the grid and customers overall and would be more appropriately planned through the transmission planning process, which would likely identify more efficient upgrades that deliver greater net benefits relative to the current, piecemeal approach of pursuing transmission upgrades via the interconnection process.
- **Study delays result in cost and uncertainty for projects,** over which developers have no control or recourse. FERC Order No. 2023 will, for the first time, impose penalties for missed study deadlines, but it remains to be seen how effective these penalties will be at improving study efficiency.
- **Cost and timeline estimates can shift dramatically** throughout the study process, forcing developers to make very costly decisions about remaining in or dropping out of the queue based on imperfect and changing information. Under Order No. 2023, projects are exempt from withdrawal penalties at the final stages of the interconnection process only if costs increase by 100%—meaning that a developer will not be able to withdraw without forfeiting potentially millions of dollars unless estimated interconnection costs more than double. Even if interconnection deposits are returned, the time and resources put into developing the project will never be recovered.
- **Lack of transparency and oversight of upgrade costs** means that developers are generally forced to accept the estimates provided by the transmission provider and



transmission owner or expend great effort to understand and contest these estimates, often unsuccessfully.

- **Lack of consideration of grid-enhancing technologies** means that more efficient and cost-effective opportunities to resolve network constraints are ignored. FERC Order No. 2023 requires consideration of certain advanced transmission technologies, which is an important step forward, but how they are evaluated and whether they are adopted remains the sole discretion of the transmission provider.
- **Projects dropping out cause re-study and delays to other projects.** Even when projects are studied via a first-ready, first served cluster approach as now required by FERC Order No. 2023, all projects that remain in the queue are impacted by the decision of some projects to drop out, which could occur as a result of any of the other challenges listed above.
- **Lack of flexibility to make minor project adjustments or adopt new technologies** in response to initial study results and additional information gained through the interconnection process, changing market conditions, or technology advancements, even if these changes do not alter the interconnection request. This is particularly problematic in light of how long many projects are now spending sitting in interconnection queues. FERC Order No. 2023 affords some additional flexibility, but still limits the type and extent of adjustments that project developers can make.

3. Execute an Interconnection Agreement

What it involves:

The Interconnection Agreement (IA) is a contract between the project, the transmission provider, and the transmission owner whose system the project will be connected to. The agreement obligates the project to pay for the identified upgrades to be completed by the transmission owner and confers the benefits of interconnection approval to the project (i.e., the right to begin operating).

Who does what:



Project developer: Negotiate and agree to final IA.



Transmission provider: Draft IA, oversee negotiation and revisions, and file executed (or unexecuted) IA with FERC.





Transmission owner (if different than transmission provider): Negotiate and agree to final IA.

Challenges and Potential Points of Failure:

- **Project developers have very little leverage in the negotiation process** given the lack of transparency and accountability throughout the interconnection study process. This often leaves developers no alternative other than to walk away from the negotiation and abandon the project. Transmission owners face no pressure or incentive to negotiate. A developer can request that an IA be filed with FERC unexecuted to dispute elements of it, but this is challenging and risky.

4. Achieve Commercial Operation

What it involves:

Achieving interconnection approval is not the only step a project must undergo to start delivering power to the grid. Bringing a project online also involves securing other approvals (e.g., siting and permitting), ensuring financial viability, and completing project construction. In addition to project milestones, the upgrades agreed to in the IA must also be completed by the transmission owner. In some cases, it will take years for a project to proceed from IA execution to commercial operation, even if everything goes as planned. In rare cases, a project may be cancelled even after executing an IA.

Who does what:



Project developer: Secures final siting and permitting agreements and permission, completes financing and/or offtake negotiation, completes procurement and delivery of project equipment and components, and undergoes construction. Developers can request up to a 3-year extension of the commercial operation date if necessary.



Transmission provider: Ensures progress on milestones to reaching commercial operation outlined in the IA.



Transmission owner (if different than transmission provider): Constructs and puts in service identified upgrades.



Challenges and Potential Points of Failure:

- **Cost and timeline overruns on the part of the transmission owner** can delay commercial operation and even threaten project viability, through no fault of the project developer. For example, it is becoming increasingly common for actual interconnection costs to significantly exceed the amounts specified in the IA (sometimes by as much as 2-4x). Similarly, it is increasingly common for transmission owners to miss their construction deadlines, which can trigger damages under a developer's PPA, impact tax equity financing, and even undermine reliability (if the project is needed to support resource adequacy). In such circumstances the IA generally allows for such cost overruns and construction delays with no recourse to the developer, even when these problems can impair the viability of a project.
- **Delays and uncertainty in the interconnection process** can make it difficult for developers to sync up other aspects of project development, such as siting, permitting, financing, and engineering and procurement. This uncertainty, on top of slow siting and permitting processes, supply chain challenges, and other roadblocks can delay a project's commercial operation.

Conclusion

The generator interconnection process is a necessary but complex multi-stage, multi-party effort that requires significant input of time and resources and involves significant risk, cost, and uncertainty. Increasingly, interconnection challenges and delays are the top barrier to new resources coming online to deliver reliable and affordable electricity. Reforms recently approved by FERC in Order No. 2023, if implemented effectively, will help to streamline and improve the interconnection process. However, additional reforms will be needed to address the challenges and potential points of failure outlined above.



Glossary of Terms:

Federal Energy Regulatory Commission (FERC): Federal agency that has jurisdiction over the interconnection process for resources connecting to the bulk power system.

Regional Transmission Organization / Independent System Operator: Independent non-profit entities that plan and operate the grid in a state or region, but do not own any generation or transmission assets. Three-quarters of the country is served by RTOs/ISOs.

Transmission Provider: The entity that oversees the FERC-jurisdictional interconnection process; in RTO/ISO regions, it is the RTO/ISO, and in non-RTO/ISO regions it is the transmission owning public utility.

Transmission Owner: The entity that owns the poles and wires. In RTO/ISO regions, the TO does not oversee the interconnection process, but provides important information to inform the interconnection request, delivers cost and time estimates for needed upgrades, and is generally responsible for building any identified upgrades.

Transmission capacity / headroom: The ability of the existing transmission system to absorb additional power before experiencing overloads that require upgrades. In most regions, transmission headroom is very limited, resulting in significant upgrades being identified in the interconnection process.

Network Upgrade: A grid upgrade or investment identified in the interconnection study process that is deemed necessary to maintain reliability while accommodating the energy to be delivered to the grid by the proposed project(s). Costs of network upgrades are assigned to projects on the basis of each project's contribution to the need for the upgrade. In addition to network upgrades, projects also face other interconnection upgrades that serve to connect their project to the broader grid system.

Interconnection Agreement: A contract between the developer, transmission provider, and (if different) transmission owner in which the parties agree to the identified interconnection upgrades.

