



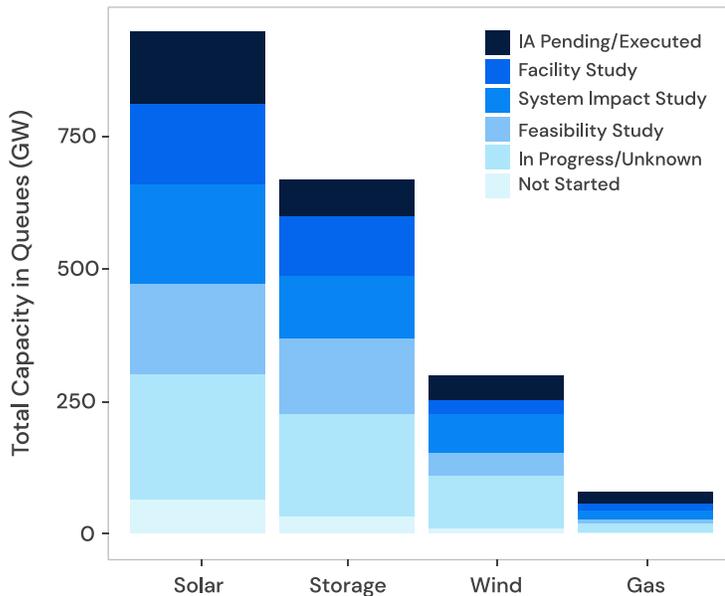
→ Can the new FERC Order 2023 solve the interconnection queue bottlenecks?

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The Federal Electric Regulatory Commission (FERC) has approved a historic piece of legislation addressing key challenges of grid interconnection. Order No. 2023¹, issued on July 28, 2023, introduces critical reforms to address interconnection queue backlogs, provide greater certainty to generators on interconnection costs and timelines, and enable a level playing field for new technologies. The interconnection queue reforms could not have happened at a more opportune time, with the energy sector undergoing a major transformation on account of challenging federal and state clean energy goals and mandates. At the same time, the generation interconnection queues across the nation face a gigantic backlog, with about 2,000 GW of clean energy and storage resources queued-up as of the end of 2022.



Figure 1: Queue trends²



- About 2,000 GW of generation and storage capacity active in the interconnection queues.
- Solar (~947 GW) and storage (~680 GW) contribute to a major share of the queue.
- Queued capacity in most ISO/RTOs exceed peak demand.
- Success rate for projects is low –As of end of 2022, for projects proposed over 2000–2017, only 21% of have come online while 72% have withdrawn from the queues.

Based on historical trends, about 80% of the queued projects don't get built. And the median duration for projects to reach commercial operation from time of interconnection request has increased to five years². Given these trends, Order 2023 establishes critical reforms to ensure resources are integrated into the transmission grid in a reliable, efficient, and timely manner.

This is crucial because timely and reliable grid interconnection of resources is key to achieve the clean energy transition. FERC, by thoroughly scrutinizing the current interconnection bottlenecks and through extensive stakeholder consultation, has developed a comprehensive set of interconnection reforms that include mandating a cluster-based

approach for interconnection studies; increased financial commitments to interconnection customers to weed out non-viable interconnection requests; imposing study delay penalties to transmission providers to ensure timely completion of interconnection studies; and evaluation of alternative transmission technologies in lieu of traditional network upgrades.

Are the Order 2023 reforms enough to tame the queue backlogs? Here are ICF's key takeaways on what the legislation means to various parties in the energy industry: developers, grid operators, and transmission providers.

¹ Improvements to Generator Interconnection Procedures and Agreements, 184 FERC ¶ 61,054, July 2023 available at <https://www.ferc.gov/media/e-1-order-2023-rm22-14-000> (Order No. 2023 referred to as Order 2023 or the Order in this paper)

² Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2022, LBNL, April 2023 available at https://emp.lbl.gov/sites/default/files/queued_up_2022_04-06-2023.pdf, pgs.8, 10, 13, 18 and 31

Order 2023's "first-ready, first-served" cluster process

The central focus of Order 2023 is the requirement for transmission providers to implement a first-ready, first-served cluster process, which includes these key elements: access to grid information prior to queue entry; studying interconnection requests in groups wherein all requests within the group have equal queue priority; and enhanced financial and readiness requirements for developers to enter and progress through the queue.

In fact, several ISO and non-ISO regions in the country have been moving in this direction in recent years to address their interconnection queue backlogs. All ISOs and several transmission providers in non-ISO regions (such as PNM, Duke, PacifiCorp, PSCo, and TSGT) have adopted a first-ready, first-served cluster process and have implemented readiness requirements to varying degrees. Order 2023 considers best practices utilized in the existing tariffs.

It is worth noting that several of these transmission providers who have implemented the first-ready, first-served cluster process are still facing queue delays.

Order 2023 and recently approved PJM reforms by FERC use similar mechanisms to manage queue volumes

PJM's interconnection reforms are one of the latest queue reforms approved by FERC prior to Order 2023³. The ISO's reforms to move from a first-come, first-served serial approach to a first-ready, first-served cluster approach were approved by FERC in November 2022. PJM started its transition process in July 2023.

Much like PJM's process, Order 2023 mandates increased financial commitments and readiness requirements for developers to enter and progress through the queue. The approach is intended to weed out speculative or non-viable requests at an early stage such that projects that are commercially ready to execute an interconnection agreement and eventually come online are processed in a timely manner. At the time of entry, developers are required to adhere to stringent site control mandates as well as a financial deposit based on MW size of the facility.

Developers are also required to make increased readiness deposits equivalent to a fraction of the assigned network upgrade costs, in later phases of the interconnection process. Developers that

withdraw requests in between the interconnection process are liable for withdrawal penalties that also increase at each stage of interconnection. .

As summarized in the below table, both Order 2023 and PJM's approved reforms have similar mechanisms to manage queue volumes in a timely, reliable, and efficient manner, however, the magnitude of the requirements vary. Site control, study deposits and readiness deposits are more stringent in the PJM reforms relative to the Order while for project withdrawals, Order 2023's provisions of explicit withdrawal penalties could be more stringent depending on stage of withdrawal. Similarly, other ISO and non-ISO regions adopting a first-ready, first-served cluster approach, have varying financial and readiness requirements for developers, compared to the Order.

Transmission providers proposing deviations relative to the Order's requirements will have to demonstrate the "consistent with or superior to" standard (applicable for non-ISOs) or the "independent entity variation" standard (applicable for ISOs).

³ For the ISO regions, PJM's queue reforms are the latest approved by FERC. In the non-ISO regions, Public Service Company of Colorado's (PSCo) queue reforms are the latest approved by FERC in June 2023.

Figure 2: Developer financial commitments and readiness requirements

Parameter	FERC Order 2023	Recently approved by FERC (PJM)	Notes
Site Control	Site control of generating facility: 90% at entry, and 100% at the time of facilities study agreement execution.	100% site control of the generating facility site at the time of entry. Additional requirements of site control of interconnection facilities at different phases of interconnection.	Order 2023 and PJM's recently approved reforms by FERC use similar mechanisms to enter and progress through queue, i.e., site control demonstration and stage-wise increased financial commitments.
Initial Study Deposit	Study deposit to be submitted at the time of entry. Deposit ranges from \$55,000 to \$250,000 based on facility MW size. [1]	Study deposit to be submitted at the time of entry. Deposit ranges from \$200,000 to \$400,000 based on facility MW size. [1]	
Readiness Deposits	Commercial readiness deposit to be submitted at each stage of the cluster study process. For the initial cluster study, the deposit is 2x study deposit. For later stages i.e. cluster restudy, facilities study and LGIA, the deposit is at 5%, 10%, and 20% of assigned Network Upgrade (NU) cost respectively. [2]	First readiness deposit of \$4000/MW upon entry. Subsequent readiness deposits of 10%, 20%, and 100% of assigned NU costs at Decision Points 1, 2, and 3 respectively. [2]	
Withdrawal Penalties	Withdrawal penalty values are equivalent to the commercial readiness deposits applicable for cluster study/cluster restudy/ facilities/LGIA stages. [3]	Depending on time of withdrawal, a percentage of readiness deposit is at risk. [3]	

Source: FERC Order 2023 and FERC Order Accepting Tariff Revisions of PJM, November 2022

[1] Range shown for greater than 20 MW facilities, deposit value varies based on facility size
Study deposit breakdown for Order 2023: >20MW and <80MW: \$35k + \$1k/MW, >=80MW and <200MW: \$150k, >=200MW: \$250k and for PJM: (1) \$75k for projects up to 20 MW; (2) \$200k for projects over 20 MW – 50 MW; (3) \$250k for projects over 50 MW – 100 MW; (4) \$300k for projects over 100 MW – 250 MW; (5) \$350k for projects over 250 MW – 750 MW; and (6) \$400k for projects over 750 MW

[2] i.e. Cumulative value of the readiness deposit. For PJM, the 2nd and 3rd readiness deposits are zero if the total prior readiness deposit paid is greater than 10% and 20% of NU costs respectively.

[3] As per Order 2023, customer exempted from the withdrawal penalty if the withdrawal is immaterial to other customers or if the withdrawal is on account of significant increase in assigned NU costs. PJM also has provisions for full refund of readiness deposits when customer withdraws on account of significant increase in assigned NU costs

Compared to PJM's approved reforms, Order 2023 introduces additional elements that increase obligations for the transmission providers as well and require incorporation of technological advancements into the interconnection process.

Increased obligations for grid operators

Publicly available grid information prior to queue entry

To enable developers make informed decisions and site projects where grid capacity is available, the Order requires transmission providers to maintain publicly available grid information. This includes interactive heatmaps of available transmission capacity at each bus, as well as additional metrics such as distribution factors and estimated impacts on the network/monitored elements because of an incremental MW injection. The heatmaps would reflect base case assumptions from the latest cluster study or restudy and the information is to be updated within 30 days of each cluster study and re-study.

Some grid operators including MISO and PJM⁴ provide such grid information prior to queue entry, though it's not a requirement under their Tariff currently to maintain such information.

Study delay penalties

In order to aid timely processing of interconnection requests, Order 2023 eliminates the reasonable efforts standard and imposes penalties to transmission providers for any study delays beyond the tariff specified timelines. The Order prescribes study delay penalties, which are set on a per day delay basis for each study phase and are capped at the study deposit amounts. Transmission providers are required to distribute the study delay penalties to the interconnection customers in the study on a pro-rata basis per interconnection request.

Grid planning and storage

Alternative transmission technologies evaluation

The Order requires transmission providers to evaluate a specified list of alternative transmission technologies such as static VAR compensators, advanced power flow control devices and synchronous condensers in the interconnection studies.

This can be a major upside to developers where a more efficient and cost-effective alternative transmission technology is feasible in lieu of a traditional network upgrade for the identified grid violations. However, the usage of the alternative transmission technology is left to the transmission provider's sole discretion. While several of the Order's reforms apply to the large generator interconnection process, the evaluation of alternative transmission technologies applies to the small generation interconnection process as well.

Dynamic line ratings, though included in the NOPR, was dropped off from the list of specified technologies in the final rule. However, the Commission does not preclude transmission providers from evaluating such additional technologies beyond those specified in the Order.

Storage

- Expands surplus interconnection rules to projects which have an executed LGIA (large generator interconnection agreement). Most system operators currently allow surplus interconnection to operational generating assets only. The Order's provisions increase the opportunity to more widely apply and take advantage of the surplus rules.
- Increases flexibility in the generation interconnection process by allowing co-located resources to share a single interconnection request.

⁴ MISO: giqueue.misoenergy.org/PoiAnalysis/index.html, PJM: <https://queuescope.pjm.com/queuescope/pages/public/evaluator.jsf>

- Upon request of interconnection customers, the Order requires usage of operating assumptions in the interconnection studies that take into account the storage facility's actual charging behavior (i.e., withdrawal from the grid) and avoid assignment of network upgrades based on worst case assumptions such as charging of the storage facility under peak load conditions. Currently, several ISOs rely on such worst case assumptions for studying storage interconnection. For example, PJM, as part of the interconnection studies, conducts a load deliverability test for storage facilities under stressed (i.e., summer and winter) peak conditions⁵. The Order's requirement for use of realistic operating assumptions pertaining to the facility's charging profile will avoid the need for unnecessary or overestimated network upgrades.

Affected systems

Siting projects along the seams is quite challenging for developers on account of high grid congestion as well as current non-uniform affected system guidelines. Order 2023 requires standardization of affected systems processes and timelines to improve the efficiency of the study process. The Order removes Network Resource Interconnection Service (NRIS) modelling requirements for identifying upgrades in affected systems as the affected system does not ensure deliverability for a generator connecting to the neighboring host system. As required in the Order, treating affected system projects under Energy Resource Interconnection Service (ERIS) standards would be more appropriate and can lead to lesser liability for network upgrades compared to NRIS standards.



⁵ PJM Manual 14H

Figure 3: Summary of Reforms proposed through FERC Order 2023

First-Ready,
First Served
Cluster Study
Process

Interconnection Information Access

Transmission Providers to post the following information publicly:

- Heat map of available injection capacity under N-1 conditions using latest cluster study or restudy base case assumptions.
- Additional metrics such as distribution factors and estimated impact of injection on each impacted transmission facility.
- Information to be updated within 30 days after completion of each cluster study and restudy.

Cluster Study

- Transmission Providers to implement a first-ready, first-served cluster study process.
- Annual cluster window.
- Increased financial commitments and readiness requirements for interconnection customers.

Allocation of Cluster Study Costs

- Transmission Provider to propose its own methodology such that 10%-50% of study costs are allocated on a per capita basis and the remainder (90%-50%) on pro-rata MW basis.

Allocation of Cluster Network Upgrade Costs

- **System network upgrade** costs allocated within a cluster using a proportional impact method.
- **Substation network upgrades shared only to customers connecting to the same substation.** Standalone network upgrades allocated to the particular generator.

Increased Financial Commitments and Readiness Requirements

- **Study deposit upon entry into cluster**, the deposit varies based on the size of facility. Study deposit for >20MW and <80MW: \$35k + \$1k/MW, >=80MW and <200MW: \$150k, >=200MW: \$250k
- **Demonstration of 90% site control at the time of submission of interconnection request**, and 100% site control at the time of facilities study agreement execution.
- **Commercial Readiness deposits:**
 - Commercial readiness deposit at the beginning of each study (i.e., initial cluster study, cluster re-study and facilities study).
 - Initial commercial readiness deposit at two times study deposit, second and third deposits brings total deposit to 5% and 10% of NU costs respectively.
 - LGIA deposit at 20% of NU costs. After execution of LGIA, the deposit will be treated as security for construction of the NUs.
- **Withdrawal Penalties:** Penalties that increase with stage of interconnection. Penalty for withdrawal during or after initial cluster study: 2x study deposit, cluster restudy: 5% NU costs, facilities study: 10% NU costs, LGIA execution: 20% NU costs. Customer exempted from the penalty in cases when the withdrawal is immaterial to other customers, and also when the customer's allocated NU cost increases by 25% compared to a previous cluster study report or increases by 100% at facilities study.

Transition Process

- **Option for existing customers to enter a transitional serial study (if facilities study agreement is tendered) or transitional cluster study or withdraw without penalty. Withdrawal penalty of nine times study cost if customer withdrawals from the transitional study.**
- **Transmission providers that already adopted a cluster study or are in transition to a cluster study are not required to implement a new transition process.**

Increase
Speed of
Interconnection
Queue
Processing

Elimination of Reasonable Efforts Standard

- **Study delay penalties to transmission providers:** \$1000/ day for cluster study and \$2000/ day for restudy and affected system study, and \$2500/day for facilities study. The penalty is subject to caps equivalent to the study deposits.
- Transmission providers must distribute the penalties to the customers on pro-rata basis per interconnection request.

Affected Systems

- Affected systems customers with executed affected systems study agreement will be higher queued than the interconnection customers of host system that have not received cluster results and lower queued than those that have received cluster results.
- Cost allocation of AFS NU costs based on proportional impact method.
- Standardized affected systems study pro-forma study and facilities construction agreements..
- **Study using ERIS modeling standards.**

Incorporate
Technological
Advancements
into the
Interconnection
Process

Increasing Flexibility in the GI process

- Allows co-located resource including storage behind the same POI to share interconnection request.
- **Surplus interconnection service extended to interconnection customers that have LGIA executed or filed.**
- **For storage, at the request of customer, to use operating assumptions in interconnection studies (including the surplus process) that reflect the asset's charging behavior.**

Alternative Transmission Technologies

- **Transmission Providers to evaluate a specified list of alternative transmission technologies such as static VAR compensators and advanced power flow control devices** in the interconnection studies.

Modeling and performance standards for non-synchronous generators

Key modifications relative to the NOPR

Order 2023 adopts most of the reforms proposed in the Commission's June 2022 Generator Interconnection Reform Notice of Proposed Rulemaking (NOPR), with certain modifications by considering the exhaustive comments received from various stakeholders.

Some of the key aspects modified in the Order relative to the NOPR:

- Non-financial commercial readiness obligations for developers: The NOPR proposed non-financial commercial readiness mandates for queue entry including offtake requirements such as an executed term sheet—an extremely high threshold to meet especially given uncertainties associated with interconnection costs. The final rule does not adopt this requirement and instead proposes commercial readiness deposits at each phase of interconnection.
- Site control: While a 100% site control demonstration at queue entry was proposed in the NOPR, the Commission slightly relaxed

this criteria in the final rule to 90%, allowing more time until facilities stage for resolving issues such as leasing difficult parcels of land, etc. Additionally, deposit in lieu of site control requirements, which was proposed in the NOPR, is not adopted in the final rule except in cases where there is a regulatory limitation.

- No informational study requirement: FERC acknowledges that the NOPR's proposal requiring transmission providers to offer an informational interconnection study is likely to add to the interconnection study delays and burden the TP's staff. The study, which only evaluates a single request, was not seen as providing any considerable value and therefore was not adopted in the Order.
- Shared Network Upgrades: NOPR's proposal for sharing network upgrade costs to later clusters that benefit from the network upgrade is not adopted in the Order. Currently, MISO and NYISO's tariff have provisions for sharing of network upgrades costs with later clusters.

What's next

Going forward, all transmission providers are required to make compliance filings within 90 calendar days of publication of the Order in the Federal Register. With the Order published in the Federal Register on September 6, 2023⁶, unless extended⁷, the current deadline for compliance filings is December 5, 2023.

Overall, the new rules are a major step to resolve the interconnection queue backlog. While the Order addresses key hurdles in the interconnection process, the issue of transmission congestion and participant funding of network upgrades is yet to be addressed. Grid capacity in several parts of the country is exhausted and high interconnection costs, driven by network upgrade costs that have increased by several-fold in recent years⁸, is one of the key reasons for queue withdrawals—which ultimately has a cascading impact on the overall queue process.

The Order's readiness requirements for developers would allow a smaller pool of viable projects to move through the interconnection queue. Given the oversubscribed state of the transmission grid and acute congestion, it's likely for the smaller pool of interconnection customers in several regions to be tagged with exorbitant network upgrade costs, making the projects economically unviable and increasing rates of project drop-off. Unless grid congestion is adequately resolved through holistic regional planning, Order 2023's reforms to resolve the queue bottlenecks will be effective only to a limited extent.

⁶ Order No. 2023 published in the Federal Register on 6 September 2023, <https://www.federalregister.gov/documents/2023/09/06/2023-16628/improvements-to-generator-interconnection-procedures-and-agreements>.

⁷ On August 28, 2023, Joint RTO's (PJM, MISO and SPP) filed a motion to extend compliance deadline to at least 90 days after Commission issues an order addressing the issues on clarification and rehearing.

⁸ See ICF report on behalf of ACORE available at https://acore.org/wp-content/uploads/2021/10/Just_and_Reasonable.pdf

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