

State of New Hampshire Department of Energy
IP 2022-01
Investigative Proceeding Relative to Customer–Generator Interconnection

Set 2 Comments of ReVision Energy
June 29, 2023

I. INTRODUCTION

Per SB 262 (2022), the State of New Hampshire Department of Energy (“Department”) is responsible for initiating a proceeding “to investigate modification of the rules of the public utilities commission in PUC 903.01(e) to ensure cost-effective, predictable, and timely interconnection procedures for customer generators to the state’s electric distribution system.”¹

On May 15, 2023, the Department hosted Technical Session 1 following the submission of initial comments by stakeholders in this investigation.

The aim of the investigation is to make specific recommendations on measures to improve New Hampshire’s interconnection procedures. The topics specified in SB 262 include:

- (a) How to create transparent, consistent and reasonable engineering standards for interconnection, with special consideration given to established best practices used by other states as set forth in the Interstate Renewable Energy Council’s (IREC) 2019 Model Interconnection Procedures.
- (b) How to ensure timely, consistent, and reasonably-priced interconnection studies.
- (c) How to ensure just and reasonable pricing of grid modernization upgrades mandated by the distribution utility for interconnection of distributed energy resources, including transparency and consistency in pricing guidelines and appropriate cost-sharing among parties benefitting from such upgrades.
- (d) How to ensure distribution system upgrades paid for by customer-generators are not claimed as part of the utility rate-base.
- (e) Whether it is appropriate to establish an “Interconnection Working Group” convened at the department of energy to regularly assess if interconnection standards need modification.
- (f) Any other topic the department reasonably believes it should consider in order to diligently conduct the proceeding.²

ReVision Energy (“ReVision”) submitted initial comments dated February 1, 2023 in response to the Department’s Order of Notice with input related to the questions posed in the Department’s Order. We also participated in Technical Session on May 15, 2023. We appreciate the opportunity to submit our Set 2 Comments in this investigation.

ReVision is an employee-owned B Corp with New Hampshire offices in Brentwood and Enfield. We also have offices in Maine and Massachusetts. ReVision develops and constructs customer-generation facilities as small as 3 kW_{AC} and as large as 5 MW_{AC}. ReVision has extensive technical, practical, and policy experience related to the issues considered in this investigation and submits these comments

¹ Chapter 328, SB 262 – Final Version

² Ibid.

with the goal of assisting the Department in developing recommendations to modernize New Hampshire's interconnection in accordance with SB 262.

II. OVERVIEW

In Technical Session 1, stakeholders were updated on utility efforts to increase data access through the development of hosting capacity analyses (HCAs) as required by SB 262. The stakeholders also worked with the Department to identify priorities for the investigation. Consideration for guidance to help improve New Hampshire's interconnection procedures included *Model Interconnection Procedures 2019* by Interstate Renewable Energy Council (IREC), which was explicitly referenced in SB 262, and Massachusetts' interconnection procedures.

Suggestions were also made on process for arriving at the recommendations and reporting required by SB 262.

In our initial comments, ReVision highlighted three other comprehensive references that are of importance in this investigation:

- *Priority Considerations for Interconnection Standards: A Quick Reference Guide for Utility Regulators* by IREC,
- *Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage* by Building a Technically Reliable Interconnection Evolution for Storage (BATRIES), and
- *Small Generator Interconnection Procedures* by the Federal Energy Regulatory Commission (FERC)

In absence of a comprehensive evaluation of the state's interconnection procedures³, ReVision offered these references as potential frameworks that the Department could use to structure its investigation.

Since the completion of Technical Session 1, Vote Solar and IREC released *Freeing the Grid*, an effort to evaluate specific interconnection policies of individual states⁴. *Freeing the Grid* grades each state based on the alignment of its interconnection procedures with national best practices:

The state grades are intended to assist policymakers and other stakeholders with identifying policy best practices for enabling the rapid growth of distributed energy resources (DERs), such as solar and energy storage, and benchmarking states' existing policies against those adopted in other jurisdictions.⁵

In its evaluation⁶, *Freeing the Grid* gives New Hampshire a grade of "D" and provides detailed criteria against which New Hampshire's interconnection procedures were measured and key recommendations for modernizing the state's interconnection rules.

³ Maine went through this process in 2021-22. In February 2022, the Interstate Renewable Energy Council published *Interconnection Standards, Practices, and Procedures to Support Access to Solar Energy and Battery Storage for Maine Homes and Businesses*, a report commissioned by the Maine Public Utilities Commission in accordance with LD 1100. The report evaluated Maine's interconnection procedures in relation to national best practices and made recommendations for modernizing Maine's rules.

⁴ See <https://www.freeingthegrid.org>

⁵ Retrieved from <http://www.freeingthegrid.org> on June 28, 2023.

⁶ The full *Freeing the Grid* Interconnection Grade for New Hampshire is available at <https://freeingthegrid.org/new-hampshire>. We have attached a copy of this information as Exhibit A.

In our comments below, we summarize the Freeing the Grid evaluation and the considerations that are largely aligned with the requirements of this investigation as specified in SB 262. We also respectfully recommend to the Department that the Freeing the Grid framework be used to help guide the parties in this investigation. The fortunate timing of the release of Freeing the Grid provides the Department with state-tailored guidance from IREC, the foremost authority on national best practices related to the interconnection of distributed energy resources (DERs). Absent a comprehensive, state-level evaluation, Freeing the Grid provides a unique opportunity for objective feedback on the efficacy of the state's written interconnection procedures.

As we recommend below, this process would benefit from utilizing the categories used in Freeing the Grid to identify where consensus exists among stakeholders and to help the group work towards consensus on topics where common ground has been identified.

III. FREEING THE GRID REVIEW OF NEW HAMPSHIRE'S INTERCONNECTION PROCEDURES

Freeing the Grid evaluated New Hampshire's interconnection procedures in ten distinct categories that include:

- Rule Applicability
- Streamlined Review
- Modifications
- Timelines & Efficiency
- Interconnection Costs & Requirements
- Updated Standards & Export Provisions
- Initial Review Screens
- Supplemental Review Screens
- Data Sharing & Reporting
- Dispute Resolution

In each of these categories, Freeing the Grid indicated that New Hampshire's interconnection rules are not aligned with best practices. Below we have summarized the criteria⁷ used by Vote Solar and IREC in its evaluation and have provided some detail related to New Hampshire's performance in each category.

a. Rule Applicability

Per Freeing the Grid, the Rule Applicability category assesses "whether a state's interconnection procedures provide clarity on the types and sizes of generators that are allowed to connect under the procedures." Their review assessed whether New Hampshire's interconnection procedures ensure that all generators, including energy storage systems, qualify for interconnection and whether facilities of all sizes have clear interconnection procedures.

Since Puc 904 applies only to "small customer-generators", which are those facilities with a "total maximum generating capacity of not more than 100 kilowatts alternating current"⁸, Freeing the Grid recommends amending the rules with specific guidance related to the review and interconnection of facilities of all sizes. Additionally, New Hampshire's interconnection rules do not include provisions related to energy storage systems as recommended by Freeing the Grid.

⁷ The full criteria used by Vote Solar and IREC can be viewed at <https://freeingthegrid.org/criteria/>. We have attached a copy of this criteria as Exhibit B.

⁸ Puc 902.26

b. Streamlined Review

Per *Freeing the Grid*, the Streamline Review category assesses “how projects are reviewed for grid impacts and whether the interconnection procedures require faster processing times for systems that meet system size or other eligibility requirements.” Their review assessed whether New Hampshire has a simplified review process for small generators, whether a Fast Track review process exists for facilities that meet specific criteria, and whether the review process is based on the export capacity of the facility or its nameplate rating.

As detailed in IREC’s *Model Interconnection Procedures 2019*, best practices include delineating the review process for facilities as follows:

- Level 1: facilities with an export rating of 25 kW or less that are subject to a simplified screening process that reflects the minimal impact of interconnecting a facility of this size.
- Level 2: facilities with an export rating greater than 25 kW that are able to meet the criteria of an expedited screening process that is more extensive than the simplified review utilized for Level 1 facilities.
- Level 3: non-exporting facilities.
- Level 4: facilities that must be screened through a comprehensive review process that is reflective of the impact that facilities that are unable to pass the simplified or expedited reviews will likely have on the grid.

By using well-defined simplified, expedited, and supplemental review processes for Level 1, Level 2, and Level 3 facilities, interconnection can be streamlined for both the customer and the utility. Defining these processes also supports data transparency and allows all parties, including the regulator, to clearly identify the responsibilities of each party.

In its *Model Interconnection Procedures 2019*, IREC defines the maximum eligible size of Level 2 facilities in the following table⁹:

Line Capacity	Level 2 Eligibility	
	Regardless of location	On ≥ 600 amp line and ≤ 2.5 miles from substation
≤ 4 kV	< 1 MW	< 2 MW
5 kV – 14 kV	< 2 MW	< 3 MW
15 kV – 30 kV	< 3 MW	< 4 MW
31 kV – 60 kV	≤ 4 MW	≤ 5 MW

New Hampshire’s interconnection rules provide some guidance on the review process for facilities of 100 kW or less, but those provisions are far less specific than the model procedures.

Additionally, New Hampshire’s penetration screen¹⁰ is far more conservative than the conservative penetration screen in the simplified review process in IREC’s *Model Interconnection Procedures*¹¹. The simplified penetration screen in the model procedures was developed in California in 1999 and designed as a conservative catch-all screen. As outlined in the National Renewable Energy

⁹ *Model Interconnection Procedures 2019*, p. 11

¹⁰ See Puc 905.06(b)(1)

¹¹ See Section III(A)(2)(b) of IREC’s *Model Interconnection Procedures 2019*, p. 7

Laboratory's *Updating Technical Screens for PV Interconnection*¹², this screen was “based on the rationale that unintentional islanding, voltage deviations, and other potentially negative impacts are negligible if the combined DG generation on a line section is always less than the minimum load.” Since the minimum load on a typical distribution system is approximately 30% of the maximum load and there is desire for the screen to be conservative, the simplified penetration assesses whether the interconnection of a new facility will cause the generation on the line section to exceed 15% of the maximum annual load. This provides a factor of safety of 2 to the assumption that the minimum load will be 30% of the annual maximum.

In the roughly 25 years since the simplified penetration screen was developed, procedures have been developed to ensure that the conservatism of the simplified penetration screen does not result in facilities being arbitrarily refused interconnection if they fail the simplified penetration screen but are otherwise safe to interconnect. This has led to the inclusion of a supplemental review process in IREC's *Model Interconnection Standards*¹³.

Freeing the Grid recommendations for streamlining interconnection review per this category include:

- Defining the review process based on facility size,
- Including a simplified review process for Level 1 facilities, an expedited review process for qualifying Level 2 facilities, and a supplemental review process for both Level 1 and Level 2 facilities, and
- Basing these reviews on the export capacity of the facility.

Clearer alignment with IREC's *Model Interconnection Procedures* related to streamlining the review process would improve the interconnection process.

c. *Modifications*

Per Freeing the Grid, the Modifications category assesses “whether the interconnection procedures provide clear processes for both minor modifications to *project design*—such as changing the operating settings on a battery storage system, and minor modifications (or upgrades) to the *distribution system*.”

Recommendations for clarifying interconnection procedures to accommodate project modifications include:

- Defining which design changes are “material modifications”;
- Allowing generator-customers to make minor system modifications during the screening process; and
- Allowing for minor modifications or upgrades to the distribution system to accommodate a customer-generator.

The provisions noted above are not currently addressed in New Hampshire's interconnection rules.

d. *Timelines & Efficiency*

Freeing the Grid's Timelines & Efficiency Category assessment focuses on how well-defined the timelines are for the utility to review an interconnection application and for an applicant to meet specific milestones.

¹² <https://www.nrel.gov/docs/fy12osti/54103.pdf>

¹³ See Section III(D) of *Model Interconnection Standards 2019*, p. 16

IREC's *Model Interconnection Procedures 2019* include timelines that reflect the depth of review required for the simplified, expedited, and supplemental review processes. For the Level 1 and Level 2 facilities discussed above in Section III(b), model timelines include:

- No more than 10 days for the utility to review the completeness of an application;
- No more than 10 days to perform the simplified review of a Level 1 facility;
- No more than 15 days to perform the expedited review of a Level 2 facility; and
- No more than 20 days to perform a supplemental review process.

Other recommended timelines include the execution of an interconnection agreement following technical review and those for the more sophisticated reviews of Level 4 facilities.

Puc 900 contains some review timelines but could benefit from delineating the simplified, expedited, and supplemental review processes to assign more reasonable review timelines based on facility size.

e. Interconnection Costs & Requirements

The Interconnection Costs & Requirements category assesses whether interconnection costs are reasonable and predictable. These costs include interconnection application fees, supplemental review costs, distribution upgrade costs, and insurance requirements. This category also assesses whether interconnection rules specify the requirements for an applicant to establish site control during the application process.

During Technical Session 1, stakeholders identified several key topics related to this area, including interconnection application fees and cost allocation for distribution system upgrades.

Freeing the Grid recommends the following best practices:

- Developing provisions that detail the requirements to establish site control;
- Adopting reasonable interconnection application fees and study costs;
- Capping the costs of distribution upgrades;
- Including provisions that equitably share upgrade costs between other interconnection facilities or utility customers; and
- Waiving insurance requirements for Level 1 facilities.

f. Updated Standards & Export Provisions

The Updated Standards & Export provisions category of the Freeing the Grid evaluation assesses whether a state's interconnection rules include requirements aligned with the most current IEEE 1547 standard, technical requirements related to generator settings, and provisions related to export capacity and non-exporting facilities.

Several of the criteria in this section were offered by Freeing the Grid as Key Recommendations for New Hampshire and are identified in Section IV below.

g. Initial Review Screens

Freeing the Grid's Initial Review Screens category includes provisions that build upon the simplified penetration screen mentioned previously in Section III(B) that serve to make the initial screening process more efficient. The recommended screening criteria in this section includes benchmarking the penetration screen to the minimum load on a line section (rather than as a percentage of the maximum load), using the facility's export capacity rather than its nameplate capacity when performing the

penetration screen, considerations for maximum facility size when a facility shares its transformer with another customer, differentiating the grounding requirements for inverter-based facilities from those for rotating generators during the screening process, and including a screen for inadvertent export from Level 3 (non-exporting) facilities with a non-exporting capacity greater than 250 kW.

New Hampshire's interconnection procedures do not include any of the provisions recommended by Freeing the Grid related to initial review screens.

h. Supplemental Review Screens

As discussed previously in Section III(b), current model interconnection procedures include supplemental review provisions to account for the conservatism of the simplified penetration screen. The supplemental review provisions provide an expedited method for reviewing the impact of a facility on voltage and power quality.

Freeing the Grid recommends the use of supplemental screening criteria that expedites interconnection of export capacity of up to 100% of minimum load and the use of voltage and power screens that reference IEEE 1547-2018 or other criteria that is applicable to the interconnection of solar energy systems.

As discussed previously, New Hampshire's interconnection rules do not include a supplemental review process.

i. Data Sharing & Reporting

The Data Sharing & Reporting category used in Freeing the Grid assesses "whether the interconnection procedures require utilities to provide detailed information to help applicants better understand grid conditions, process timelines, project impacts, and cost estimates." As described by the authors, "[t]hese provisions are meant to increase process transparency and access to grid information to better inform siting and project design decisions."

Recommended provisions for increasing transparency include:

- Detailed screening results for simplified, expedited, and supplemental reviews and study reports for Level 4 facilities;
- Itemized cost estimates when utility upgrades are required for interconnection;
- Publicly available interconnection queues that are updated monthly and provide details that track the progress of each project;
- A pre-application process that allows a customer to assess grid conditions near the point of interconnection prior to submitting a full application;
- Published hosting capacity maps that assist with siting DERs; and
- Annual public reporting of interconnection costs and timelines.

Progress on the use of hosting capacity maps from New Hampshire's utilities were discussed during Technical Session 1. Freeing the Grid concluded that there is ample opportunity to improve New Hampshire's interconnection rules related to data sharing and reporting due to the lack of many of the aforementioned provisions in Chapter Puc 900.

j. Dispute Resolution

The final category assessed by Freeing the Grid is the inclusion of provisions that provide clear steps and timelines for resolving interconnection disputes that arise between the customer-generator and utility. IREC's *Model Interconnection Procedures 2019* includes provisions related to dispute resolution¹⁴ that detail an efficient process for the regulator and affected parties to manage disagreements in the application of the state's interconnection rules. Effective dispute resolution processes serve to minimize disputes by providing clear accountabilities for all parties and proactive steps – such as the inclusion of an interconnection ombudsperson or the use of a regularly-scheduled interconnection forum – that serve to identify and address issues related to limitations in the existing rules or implementation of existing rules.

IV. KEY RECOMMENDATIONS FROM FREEING THE GRID

From the criteria and guidance provided in Freeing the Grid, the following key recommendations were made for improving New Hampshire's interconnection procedures:

- Incorporate energy storage as an eligible technology within the definition of “generating facility”
- Incorporate the definition of “export capacity” in the rules and identify acceptable export control methods, including certified Power Control Systems
- Use export capacity to determine eligibility for the simplified review process
- Adopt a Fast Track review process for systems larger than 100 kVA and use 100% of minimum load rather than 7.5% of peak load in the penetration screen
- Adopt a defined Supplemental Review process with specified screens that apply to systems larger than 100 kVA¹⁵

As detailed in the “Introduction to Interconnection Grades”, Freeing the Grid focuses on formal inclusion of provisions in state interconnection rules¹⁶:

Because interconnection rules dictate how DER projects get reviewed and approved for operation on the electric grid, they are critical to the fair and efficient processing of interconnection requests. If the rules are designed to promote streamlined review and clarity around timelines and costs, they can help to ensure that solar and other distributed energy resources are interconnected more rapidly. If the rules do not incorporate best practices related to costs, timelines, and review process transparency, the result is often clogged interconnection queues and delays that can stretch for months or years, as well as canceled projects if required grid upgrade costs are too high.

As a result, the primary mechanism by which New Hampshire can best promote “cost-effective, predictable, and timely interconnection procedures for customer generators to the state's electric distribution system”¹⁷ is through changes to Chapter Puc 900 of the New Hampshire Public Utilities Commission's rules.

¹⁴ *Model Interconnection Procedures 2019*, Section IV(B), p. 24

¹⁵ Freeing the Grid, New Hampshire Interconnection Grade, retrieved from <https://freeingthegrid.org/wp-content/uploads/2023/06/FTG-New-Hampshire.pdf> on June 28, 2023.

¹⁶ Retrieved from <https://freeingthegrid.org/introduction-to-interconnection-grades/> on June 28, 2023.

¹⁷ Chapter 328, SB 262 – Final Version

V. RECOMMENDATIONS OF REVISION ENERGY

Since the purpose of this investigation is to investigate the modification of New Hampshire's interconnection rules, ReVision respectfully recommends that the Department use the results from Freeing the Grid to guide this investigation. Namely, we recommend the following procedure:

- Direct each stakeholder to review the key recommendations made for New Hampshire by Freeing the Grid – as highlighted above in Section IV – and to comment on (a) whether they are in agreement with the recommendation and (b) whether they would support inclusion of the provision in the recommendations made by the Department as part of this investigation;
- Direct each stakeholder to review the recommendations in each of the categories named above in Section III and to identify recommendations that they agree will strengthen New Hampshire's interconnection procedures;
- Compile a list of recommendations upon which the stakeholder group has consensus and identify the recommendations that have general consensus; and
- Dedicate one of the Technical Sessions to discussing the recommendations that have general consensus to determine whether consensus can be achieved.

Centering the framework of this investigation on a resource that has already identified key opportunities to improve New Hampshire's interconnection rules should maximize the time and input of the stakeholders in this investigation in a manner that provides "special consideration given to established best practices used by other states as set forth in the Interstate Renewable Energy Council's (IREC) 2019 Model Interconnection Procedures."¹⁸

As indicated by Freeing the Grid, formalizing interconnection best practices into Commission rules, such as Puc 900, is critical for providing the predictability and accountabilities for all parties. It is our hope that through this process, the stakeholders can identify provisions for which there is consensus, begin to implement practices that are consistent with the consensus provisions, and recommend regulatory and legislative actions that will be necessary to formalize changes in New Hampshire's interconnection rules that are consistent with best practices.

We look forward to participating in Technical Session 2 on July 18, 2023 and appreciate the opportunity to comment here.

¹⁸ Chapter 328, SB 262 – Final Version

GRID

New Hampshire | Interconnection Grade



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Recommendations

- Incorporate energy storage as an eligible technology within the definition of "generating facility"
- Incorporate the definition of "export capacity" in the rules and identify acceptable export control methods, including certified Power Control Systems
- Use export capacity to determine eligibility for the Simplified review process
- Adopt a Fast Track review process for (cont.)

Interconnection policies specify the processes, timelines, and costs associated with connecting distributed energy resources — like solar and energy storage systems — safely and reliably to the grid. This state's interconnection grade is based on the following criteria:*



Rule Applicability

Facility types and system sizes eligible to interconnect



Updated Standards & Export Provisions

Incorporation of IEEE 1547-2018 and export provisions



Streamlined Review

Use of simplified and expedited screening processes



Initial Review Screens

Technical screens used as part of expedited review



Modifications

Facility and distribution system modifications



Supplemental Review Screens

Technical screens used in supplemental review



Timelines & Efficiency

Timelines specified for review and other processes



Data Sharing & Reporting

Provision of queue, timeline, cost, and site-specific data



Interconnection Costs & Requirements

Fees and other requirements for interconnection



Dispute Resolution

Interconnection-specific processes for resolving disputes

Freeing the Grid grades states on key statewide policies that impact clean energy growth, helping them identify best practices and benchmark their existing policies against other states'.

NOTEWORTHY BEST PRACTICES

ENERGY STORAGE

Awarded to states that have included energy storage as an eligible technology in their interconnection rules, incorporated the concept of export capacity, and identified acceptable export control methods.



TRANSPARENCY

Awarded to states that require pre-application reports, detailed screening and study results, itemized upgrade cost estimates, and at least monthly public queue reporting that allows for the tracking of the interconnection process steps.



IEEE 1547-2018

Awarded to states that have incorporated the IEEE 1547-2018 Standard and identified or referenced performance categories as well as voltage and frequency settings.



This section recognizes noteworthy interconnection best practices, from among the evaluation criteria. Badges (🏆) are awarded to the states that meet these noteworthy criteria.

Recommendations cont.

systems larger than 100 kVA and use 100% of minimum load rather than 7.5% of peak load in the penetration screen

- Adopt a defined Supplemental Review process with specified screens that applies to systems larger than 100 kVA

*For a detailed summary of all evaluation criteria, please visit FreeingtheGrid.org/Criteria

Freeing the Grid is a joint initiative of the Interstate Renewable Energy Council (IREC) and Vote Solar that grades states on specific policies that help to increase clean energy adoption and access to the grid. The state grades are intended to assist policymakers and other stakeholders with identifying policy best practices for enabling the growth of distributed energy resources (DERs), such as solar and energy storage, and benchmarking their existing policies against those adopted in other states.

Between 2007 and 2017, the project team released ten report cards that included state grades for both interconnection and net metering policies. In this 2023 release, IREC used updated interconnection scoring criteria based on best practices that have emerged in the last five years to grade all 50 U.S. states plus the District of Columbia and Puerto Rico. Future releases will include grades on statewide DER compensation policies from Vote Solar, as well as information on the important equity implications of interconnection policies.



For more information, visit FreeingtheGrid.org



Interconnection Grade Criteria

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The interconnection criteria included in Freeing the Grid (FTG) represent best practices and model provisions informed by stakeholder discussions and adopted through state regulatory proceedings.

The 2023 version of FTG includes 56 criteria worth 63 possible points that are separated into 10 categories. For comparison, the last release of FTG in 2017 included 42 criteria—including seven bonus criteria—worth 30 possible points.

Because of the substantial changes in the number of criteria, reflective of new best practices in energy storage interconnection and other provisions, the state grades for 2023 are not being compared to state grades in prior FTG releases.

New and Updated Criteria

To revise and incorporate additional FTG criteria, IREC identified key provisions included in its 2019 [Model Interconnection Procedures](#). IREC also referred to the solutions and model language developed as part of [Building A Technically Reliable Interconnection Evolution for Storage \(BATRIES\)](#), a project funded by the U.S. Department of Energy that identified and developed solutions to regulatory and technical barriers to the interconnection of energy storage and solar-plus-storage systems to the distribution grid. These solutions and model language were published in the resulting [Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage](#).

The BATRIES project team¹ also discussed new provisions that have been adopted by certain states and identified as emerging best practices, such as improved review processes (e.g., initial review screens) to decrease the time and cost of interconnection while continuing to maintain safety and reliability.

In addition to internal discussions to refine and update the criteria, IREC solicited feedback from third-party interconnection experts to ensure that the final criteria represent the most critical provisions and practices for streamlined project review and connection to the grid.²

A list of all criteria by category and a brief discussion of each is below (new criteria and language are indicated in red text and the tables also include the number of states or territories that received full or partial credit for each criterion).

Rule Applicability Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Rule Applicability (only one may apply within the outlined box)	All generators qualify (“generator” definition must be inclusive of energy storage systems in addition to other distributed energy resources)	1	24
	Generators up to at least 2 megawatts (MW) are eligible	0.5	2
	Generators larger than 2 MW and up to 20 MW are eligible	1	15
	All state-jurisdictional generator interconnections are eligible, regardless of size	2	21

The Rule Applicability category measures whether a state’s interconnection procedures provide clarity on the types and sizes of generators that are allowed to connect under the procedures. These provisions can become

especially important for applicants seeking to interconnect a system that may not be explicitly mentioned in the rules, such as an energy storage system or a project that exceeds the stated size threshold but still falls under the jurisdiction of the state. Incorporating new technologies, such as energy storage, and specifying that all state-jurisdictional interconnections are covered under the rules helps to increase process transparency and clarity.

Best Practices

- Explicitly include energy storage systems as an eligible technology in the rules (e.g., within the definition of “generating facility,” “distributed energy resource,” or similar term)
- Remove any size limit restriction to allow all state-jurisdictional interconnections to be eligible under the rules

Streamlined Review Category

The criteria under the Streamlined Review category relate to how projects are reviewed for grid impacts and whether the interconnection procedures require faster processing times for systems that meet system size or other eligibility requirements. With the exception of the last criterion above, these provisions can speed up the interconnection process for projects by altering the type of review based on location (e.g., group studies) or system size (e.g., simplified and expedited processes), while continuing to maintain safety and reliability.

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Streamlined Review (only one may apply within each of the two outlined boxes)	Simplified review process for certified, inverter-based generators up to 10 kilowatts (kW)	0.5	17
	Simplified review process for certified, inverter-based generators at least 25 kW	1	11
	Simplified review process for certified, inverter-based generators at least 50 kW with export capacity of 25 kW or higher	2	10
	Expedited review process available for certified, inverter-based generators up to 2 megawatts (MW)	0.5	18
	Expedited review process available for certified, inverter-based generators up to at least 5 MW (based on line capacity and distance from substation)	2	15
	Eligibility for expedited review is based on a system's export capacity rather than nameplate capacity	2	9
	Offers an option for a group or cluster study process	1	10
	Rules include at least one provision to streamline, incentivize, or otherwise support the interconnection of distributed energy resources to benefit disadvantaged or underserved households	1	1

Note on Simplified and Expedited Review

Under simplified³ and expedited⁴ review, technical evaluation (i.e., evaluation to ensure that the project would not cause adverse grid impacts) is typically limited to a set of screens or thresholds that identify systems that could trigger adverse system impacts and require closer review. Increasing the size limits for simplified and expedited review can allow more projects to go through these more efficient screening processes and potentially avoid longer study processes.

For projects that can be programmed to operate below their rated—or nameplate—capacity, such as energy storage systems paired with a device that can limit the amount of power sent to the grid, basing review process eligibility on that export capacity would allow projects that operationally fall under the size limits to go through streamlined review.

Note on Group Studies

Another way to potentially streamline review is through group studies. Some states have begun to implement group or cluster study processes as a way to review a set of projects at the same time (as opposed to the

current approach which reviews projects sequentially) and to allow interconnection customers to more fairly share the costs of upgrading equipment on the grid when constraints are identified.

Note on Equitable Interconnection

Interconnection policy discussions traditionally have not included consideration of how interconnection can pose a barrier to equitable access to sustainable energy for disinvested,⁵ BIPOC, and low-wealth communities, which often suffer from significant underinvestment in grid infrastructure. To address equitable access to the grid, interconnection policies and practices can be designed to reduce barriers, and increase access, to clean energy in disadvantaged or underserved communities. IREC added this provision to signal that this is an important and emerging area of interconnection policy. New Mexico is the only state that received credit for this criterion through a provision that includes increasing access to low-income subscribers and underserved communities as a metric for determining whether there is a public benefit to employing a cost-sharing mechanism.⁶

Best Practices

- Offer simplified and expedited review processes for inverter-based systems that base system size eligibility on export capacity
- Adopt a group or cluster study review option
- Incorporate a provision that helps to support DER interconnections that benefit disinvested, BIPOC, and low-wealth households and communities

Modifications Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Modifications	Generators that require minor grid upgrades identified in initial or supplemental review are not required to undergo full study	1	33
	Rules allow for minor project modifications to resolve certain issues identified in the screening or study process	1	26
	Rules define what constitutes a material modification and the process associated with requesting material modification review	1	16

The criteria under the Modifications category measure whether the interconnection procedures provide clear processes for both minor modifications to *project design*—such as changing the operating settings on a battery storage system, and minor modifications (or upgrades) to the *distribution system*. Defining processes for each of these types of modifications can help to clarify how and when an applicant can propose project modifications and whether or not they can pay for minor grid upgrades, if necessary, to avoid further study.

Note on Minor System Modifications

During the screening process within initial and supplemental review, utilities can determine whether minor grid upgrades are necessary to address any safety and reliability issues. Allowing interconnection applicants to pay for the upgrades identified during the screening process and avoid lengthy study processes can save time for both utilities and applicants.

One screen that is common in many states' rules is the “no construction” screen applied during initial review, which fails a project if any utility construction is required, including minor grid upgrades. Though some states may still provide a way for the applicant to pay for minor upgrades and not go through the study process even with the “no construction” screen present, removing it can improve clarity around the process.

Note on Minor Project Modifications

Though the language for this provision seems similar to the criterion on minor *system* modifications above, minor *project* modifications are focused on changes or modifications that the applicant can make to the proposed project to avoid or minimize grid impacts and avoid further study. If the system includes energy storage, this could also include changes to the operating characteristics or settings. If states provide detailed information related to grid impacts through screening and study results, an applicant could propose project modifications to resolve any identified issues rather than having to go through additional evaluation or withdrawing the application.

Best Practices

- Allow for minor system modifications during initial and supplemental screening processes
- Allow for minor project modifications in response to screening or study results
- Define “material modification” and include a process for material modification review

Timelines & Efficiency Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Timelines & Efficiency	Application completeness reviewed in no more than 10 business days	1	34
	Simplified (Level 1) review completed within 10 business days	1	16
	Initial review (e.g., Fast Track or Level 2) screens, if any, applied in no more than 15 business days	1	20
	Supplemental review, if any, applied in no more than 20 business days	1	15
	Timeframe for utility completion of study process is less than 120 calendar days	1	16
	Timeframe specified for utility to provide an interconnection agreement	1	22
	Utilities are required to provide interconnection agreement at the same time that customers are notified that they passed interconnection screens	1	14
	Timeframe specified for utility to provide permission to operate (PTO)	1	16

The criteria included above measure whether the interconnection procedures specify timeframes for certain process steps and require efficient timelines for the review of interconnection applications and the stages of the grid impacts review process. Incorporating timelines helps to provide process transparency and set expectations for the amount of time certain steps should take for both interconnection customers and utilities. Though the above provisions are focused on utility actions within the process, states generally provide timeframes for applicant actions as well, which can help to move projects forward in a timely manner or remove them from the project queue if they do not meet required deadlines.

Best Practices

- Specify timelines for all interconnection steps, including application review, technical screening evaluation, study, etc.
- Ensure that the review timelines for simplified, initial, and supplemental review are aligned with best practices

Interconnection Costs & Requirements Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Interconnection Costs & Requirements	Rules clearly identify site control requirements and require documentation to be submitted with the interconnection request	0.5	25
	Application fees are no more than \$300 for certified, inverter-based generators up to 25 kilowatts (kW)	0.5	31
	Application fees are no more than \$2,000 for certified, inverter-based generators up to 5 megawatts (MW)	0.5	13
	Supplemental review cost, if any, is capped at no more than \$2,500	0.5	5
	Upgrade costs capped at amount estimated in interconnection agreement or studies (+/- 10-30%)	1	2
	Mechanism available to enable customers to share the costs of distribution upgrades (e.g., fee waivers, group studies, fixed fees, etc.)	2	17
	Insurance requirements waived for inverter-based generators up to 25 kW	1	25
	External disconnect switch requirements waived for inverter-based generators up to at least 10 kW	1	13

The criteria under the Interconnection Costs and Requirements category measure whether the interconnection procedures include provisions that help to lower interconnection costs. These provisions specify reasonable fees and requirements for interconnection that can improve cost certainty for applicants.

Note on Site Control Requirements

Site control requirements are a way for states to get applicants to demonstrate that, if approved, their projects can be legally interconnected at a proposed site. These provisions typically require applicants to provide documentation to show either ownership or rights—such as a landowner’s consent—to develop a project at the proposed site, which can demonstrate greater project viability and be a deterrent to speculative interconnection applications that can otherwise contribute to queue backlogs.

Best Practices

- Require documentation to demonstrate site control
- Adopt reasonable application fees for small projects and systems up to 5 MW
- Adopt reasonable costs for supplemental review
- Include an upgrade cost cap
- Adopt a mechanism to share upgrade costs among other applicants or utility customers
- Waive insurance requirements for systems up to 25 kW
- Waive external disconnect switch requirements for systems up to at least 10 kW

Updated Standards & Export Provisions Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Updated Standards & Export Provisions	Date by which the distributed energy resource (DER) must comply with IEEE 1547-2018 is clearly identified in the rules	1	5
	Rules either identify or reference a separate Commission-approved document which identifies performance categories, voltage regulation, and other default settings	2	7
	Rules explicitly define and differentiate between the concept of nameplate and export capacity	1	11
	Rules identify acceptable export control methods	2	9
	Rules identify certified Power Control Systems as an acceptable export control method	1	8

The criteria under the Updated Standards and Export Provisions category measure whether the interconnection procedures incorporate IEEE Standard 1547™-2018, technical requirements, and provisions related to allowing for export control. These provisions help to clarify DER requirements for interconnection as well as export control means that have been vetted and approved for operation.

For more information on incorporating IEEE Standard 1547-2018, see IREC's [Decision Options Matrix for IEEE 1547-2018 Adoption](#).

For more information on incorporating export control provisions, see the BATTERIES [Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage](#).⁷

Best Practices

- Identify a date by which DERs must comply with IEEE 1547-2018
- Identify or reference an external Commission-approved document that identifies performance categories, voltage regulation, and default settings
- Explicitly define “nameplate capacity” and “export capacity”
- Identify acceptable export control methods, including certified Power Control Systems

Initial Review Screens Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Initial Review Screens	The penetration screen allows expedited interconnection of projects that do not cause exceedance of at least 90% of minimum load with aggregated generation	3	7
	Above technical review screen is based on export capacity	2	2
	The transformer screen (also called the shared secondary screen) evaluates projects based upon the ratio of aggregated DER (nameplate or export) to transformer nameplate rating being greater than or equal to 65%	1	11
	Above transformer screen is based on export capacity	1	3
	Clearly defined Line Configuration Screen (LCS) within initial review that differentiates requirements for inverter-based distributed energy resources (DERs) vs. rotating DERs	1	1
	Inadvertent export screen applied during initial review for systems with non-exporting capacity greater than 250 kW	1	1

The criteria under the Initial Review Screens category measure whether the interconnection procedures have incorporated new and revised initial review screens. Each provision in this section is new aside from the penetration screen which was updated to allow for aggregated generation of at least 90 percent of minimum load to pass through the screen rather than 15 percent of annual peak load. These changes and additions represent new and updated practices related to the assessment of grid impacts.

For more information about the screens listed above, see the BTRIES [Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage](#).⁸

Best Practices

- Incorporate the following screens under the initial review process:
 - A penetration screen that allows expedited interconnection up to at least 90 percent of minimum load and is based on export capacity
 - A transformer, or shared secondary, screen that evaluates projects based upon the ratio of aggregated DER to transformer nameplate rating being greater than or equal to 65 percent and is based on export capacity
 - A clearly defined Line Configuration Screen (LCS) that differentiates requirements for inverter-based DERs vs. rotating DERs
 - An inadvertent export screen for systems with non-exporting capacity greater than 250 kW

Supplemental Review Screens Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Supplemental Review Screens	Supplemental review screens are applied to generators that do not pass initial review screens to allow expedited interconnection up to at least 100% of minimum load	2	12
	Above supplemental review screen is based on export capacity	2	3
	A voltage and power quality screen within the supplemental review either (a) references IEEE 1547-2018 without reference to IEEE 519, (b) uses an equivalent screen (i.e., 3% rapid voltage change limit or short-term flicker severity calculation), or (c) does not require rapid voltage or flicker screening for solar energy systems	1	4

The criteria under the Supplemental Review Screens category measure whether the interconnection procedures require a penetration screen based on at least 100 percent of minimum load and an updated voltage and power quality screen within supplemental review. The new criteria change the way systems are evaluated under both

of the screens. With the new changes, the penetration screen would evaluate aggregated generation based on export capacity and the voltage and power quality screen would either incorporate an IEEE 1547-2018 reference, use an equivalent voltage screen as IEEE 1547-2018, or not require rapid voltage or flicker screening for solar energy systems.

For more information on using export capacity in the supplemental review penetration screen, see the [BTRIES Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage](#).⁹

Best Practices

- Adopt a defined supplemental review process that includes the following screens:
 - A penetration screen that allows expedited interconnection up to at least 100 percent of minimum load and is based on export capacity
 - A voltage and power quality screen that either (a) references IEEE 1547-2018 without reference to IEEE 519, (b) uses an equivalent screen (i.e., 3 percent rapid voltage change limit or Pst voltage flicker calculation), or (c) does not require rapid voltage or flicker screening for solar energy systems

Data Sharing & Reporting Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
Data Sharing & Reporting	Screen results (for simplified, Fast Track and supplemental review where available) are provided in a detailed format	1	26
	Study reports are required to provide details of analysis and how conclusions were reached	1	21
	Upgrade cost estimates are provided in a detailed and itemized format that identifies labor, equipment, etc.	1	21
	Utilities post an interconnection queue that is updated at least monthly	1	8
	Utilities are required to publish queues that enable tracking of timelines associated with each step of the interconnection process for each project in the queue	2	4
	Customers may request a pre-application report that provides specific information on an identified point of interconnection for a fee that does not exceed \$500	1	18

Hosting capacity analysis is utilized in the screening process	2	3
Utilities are required to provide a public report on interconnection timelines and costs at least once annually	1	15

The criteria under the Data Sharing and Reporting category measure whether the interconnection procedures require utilities to provide detailed information to help applicants better understand grid conditions, process timelines, project impacts, and cost estimates. These provisions are meant to increase process transparency and access to grid information to better inform siting and project design decisions.

Note on Hosting Capacity Analysis

The incorporation of hosting capacity analysis (HCA) within a state's screening process is an emerging practice that can improve both transparency and screening accuracy. But in order to use HCA in screening, a state must consider many factors to ensure that HCAs are accurate and designed to be used within the interconnection process. For more information on considerations related to hosting capacity analyses, see IREC's [Key Decisions for Hosting Capacity Analyses](#).

Best Practices

- Provide detailed screen and study results to applicants, including analysis, supporting data, and justification for failed screens or need for further study and/or grid upgrades
- Provide detailed and itemized cost estimates to applicants
- Require utilities to post an interconnection queue that is updated monthly and allows for the tracking of timelines associated with each step of the process
- Require utilities to offer pre-application reports that cost no more than \$500 and include a specified set of data points for a potential project site
- Develop a robust hosting capacity analysis and use it as part of the screening process
- Require utilities to submit an annual report on interconnection timelines and costs that is publicly available

Dispute Resolution Category

Category	FTG Interconnection Scoring Criteria	Point Value	Number of States/Territories That Received Credit (out of 39)
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Dispute Resolution	Dispute resolution process in place to address disputes	1	28
	A regular interconnection forum is provided to facilitate resolution of technical and policy issues that arise	1	0
	Rules require Commission or other entity to offer services of an ombudsperson or equivalent role to track and facilitate dispute resolution	1	13

The criteria under the Dispute Resolution category measure whether the interconnection procedures require processes to help resolve interconnection disputes. Interconnection disputes can arise over many issues, including timeline compliance and upgrade cost estimates. Providing a clear process and timeframes for dispute resolution is critical to ensuring that issues can be addressed in a timely manner.

Note on Interconnection Forum

Though a dedicated interconnection forum where stakeholders can address emerging challenges on an ongoing basis has not yet been incorporated in any state's interconnection procedures, it is an emerging practice that can offer regular opportunities to discuss and address interconnection issues.

Best Practices

- Adopt a dispute resolution process that is specific to interconnection disputes
- Offer a regularly-held interconnection forum to address technical and policy issues that arise
- Incorporate a pathway to resolve process or other disputes through the services of an ombudsperson or other facilitator

Footnotes

1. The BATRIS project team was led by the Interstate Renewable Energy Council (IREC) and included the Electric Power Research Institute (EPRI), the Solar Energy Industries Association (SEIA), the California Solar & Storage Association (CALSSA), utilities New Hampshire Electric Cooperative Inc. (NHEC) and PacifiCorp, and law firm Shute, Mihaly & Weinberger, LLP (SMW). [↩](#)
2. The following organizations reviewed and provided feedback on the 2023 FTG criteria: the Coalition for Community Solar Access (CCSA), the U.S. Department of Energy, the Institute for Local Self Reliance (ILSR), the Smart Electric Power Alliance (SEPA), Sunnova, Sunrun,

and Vote Solar. Note: an organization's mention here does not imply their endorsement of the FTG grades, criteria, or resources. ↵

3. The simplified review process is also referred to as "Level 1" review or the "Small, Inverter-based System Review." ↵
4. The expedited review process is also referred to as "Level 2" or "Fast Track" review. ↵
5. The term disinvested community is used here to "refer to communities that (1) receive inadequate social and economic services and resources and (2) experience consequences or impacts from policy decisions more acutely due to historic marginalization. These communities also often face high barriers to participation in decision-making processes. Communities of color and Indigenous communities, low-income communities, and immigrant communities are some groups that are more likely to be disinvested. Other terms that are commonly used to refer to communities experiencing similar dynamics include marginalized communities, environmental justice communities, and disadvantaged communities. These terms are often used differently in different settings, and no one term is appropriate for all communities." This definition is taken from the American Council for an Energy-Efficient Economy (ACEEE)'s [Leading with Equity Initiative: Year Two Recap and Next Steps](#). ↵
6. New Mexico Administrative Code, Title 17, Chapter 9, Part 568, Section 19, <https://www.srca.nm.gov/parts/title17/17.009.0568.html> ↵
7. Interstate Renewable Energy Council, Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage, pp. 45-55 (March 2022). <https://energystorageinterconnection.org/resources/batries-toolkit/> ↵
8. Interstate Renewable Energy Council, Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage, pp. 62-66 and 132-135 (March 2022). <https://energystorageinterconnection.org/resources/batries-toolkit/> ↵
9. Interstate Renewable Energy Council, Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage, pp. 62-63 (March 2022). <https://energystorageinterconnection.org/resources/batries-toolkit/> ↵

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