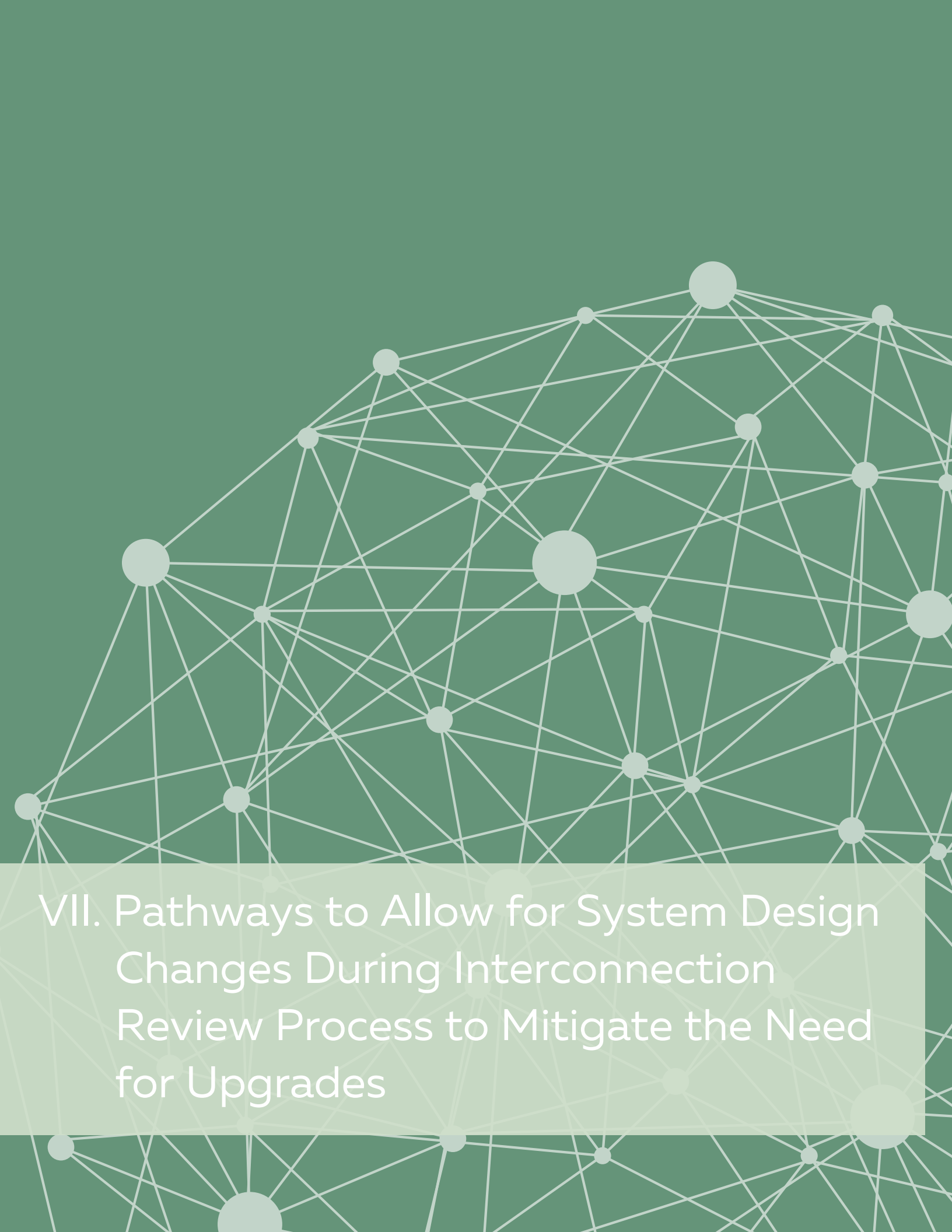

VII. Pathways to Allow for System Design Changes During Interconnection Review Process to Mitigate the Need for Upgrades

VII. Pathways to Allow for System Design Changes During the Interconnection Review Process to Mitigate the Need for Upgrades

A. Introduction and Problem Statement

As projects go through the interconnection process, utilities may identify system impacts caused by the project that necessitate distribution system upgrades. Some storage projects can make changes in proposed charging and discharging behavior, inverter functions, or export amounts that could mitigate the need for upgrades identified by the utility. Since the system impacts may not be known until after the screening or study process, interconnection customers would like to be able to modify projects after receiving results without submitting a new application and losing their interconnection queue position. However, the interconnection review process typically is not designed to allow for customers to undertake project design changes that could help to avoid grid upgrades and minimize interconnection delays during the review process.

In most jurisdictions, if the utility finds that grid upgrades are needed for a project to proceed, the customer is often given two choices: (1) to pay for the upgrades, or (2) to withdraw the project, forfeit their place in the interconnection queue, and submit a new design and application. Most procedures do not expressly allow design changes as a third option. The time delays and costs associated with this practice can be substantial for both utilities and customers.

From the customer perspective, the major barriers to a more efficient interconnection review process include: 1) the lack of data access that may help them design and site projects to avoid grid constraints at the outset or redesign utility-reviewed projects to mitigate impacts, and 2) the lack of clear steps that could enable them to address system impacts following utility review and understand when restudy is required. From a utility standpoint, the main challenge is the staff time required to review resubmitted applications, screen projects for impacts, or engage in back-and-forth dialogues with customers to resolve outstanding issues. In addition, utilities and interconnection customers as a group may be reluctant to employ informal resolution approaches for fear that customers farther back in the queue may object to accommodating customers who are given an opportunity to make revisions to a project without surrendering their queue position. Utilities also must strive to provide equal treatment to all customers.

Some states and utilities have incorporated new processes to ensure sufficient data is provided with screening and study results and to provide customers with an option to resolve interconnection issues via certain allowed design changes while remaining in the queue. Based on current practices as well as information provided by developers and utilities, it is recommended these features be included in interconnection rules and related procedures in order to increase the successful interconnection of DERs. Storage

capabilities to modify export can be leveraged to tailor the DER system to grid constraints when using these practices.

B. Types of System Modifications That an ESS Could Implement to Mitigate Impacts

Due to the flexibility that ESS provides, both to the customer and as a resource to the grid, it is important to recognize the manner in which system parameters may be changed to mitigate impacts identified during the interconnection process. The below paragraphs discuss the various modifications that may be utilized by an ESS project to mitigate or avoid impacts during the review process.

An ESS project may offer one or more use cases, such as self-supply and peak shaving. The ESS may employ operating schedules, potentially through the use of a Power Control System (PCS) or other export limiting equipment (see Chapter III for a discussion of the methods for controlling export and Chapter IX for further discussion of how the use of schedules can be relied upon and communicated to the utility). Also note that the same storage system may offer grid support functions (such as volt-var or fixed power factor) though this is not explored further herein since it applies to all inverter-based DERs.

PCS can be utilized by interconnection customers to limit export to the distribution system to a value less than the Nameplate Rating of the DER. Customers with storage may include PCS in their DER design, either in the original application or as a design change to address an identified impact (such as maintaining export limits within distribution system constraints). Where a PCS was included in the original DER design, the utility will have evaluated the system's proposed Export Capacity in its analysis and screens, per Chapter IV. To address certain impacts, it may be possible for the customer to revise the Export Capacity to a new limit. On the other hand, where a PCS was not included in the original DER design, the utility will have evaluated the system's full nameplate capacity in its analysis. It is possible for the customer to add PCS equipment that would change the Export Capacity to a new limit. Customers may wish to operate ESS in a manner that mitigates impacts during periods with grid constraints. As an example, during days (or hours) where the grid is restricted, the storage system could be scheduled to charge or discharge following a local operating schedule or one based on control signals. Where an ESS operating schedule is verifiable and can maximize hosting capacity and mitigate impacts during grid constraint periods, a customer could be allowed to modify the ESS operating schedule such that Export Capacity does not increase beyond a predetermined value. Alternatively, where utility control systems (such as a distributed energy resource management system, or DERMS) are deployed, signaling may be used to change export limits dynamically in response to real-time grid constraints.

Customers may consider adding storage to a DER design (that did not originally contain ESS) in order to address identified upgrades or screen failures. For example, an exporting PV system could charge an ESS which could then discharge at a later time ("time-shifting") and implement a reduced Export Capacity. This concept could be extended by applying a

schedule or dynamic signal to avoid grid constraints at certain hours. Note that adding AC-coupled energy storage increases the Nameplate Rating of the DER as well as the rated fault current. Where a PCS maintains or decreases Export Capacity, adding AC-coupled storage can be acceptable, but the utility may need to reassess the fault current impacts.

In the initial application, the interconnection customer will identify the proposed ESS operating profile and the utility will evaluate such characteristics in the applicable screening and/or study process. The following sections will provide recommendations on how information can be provided during the interconnection review process to: (1) identify where modifications may be feasible to mitigate impacts, and then (2) provide defined opportunities for any of the above storage characteristics to be modified, so long as they are designed to mitigate the grid impacts identified in the screen or study results.

C. Recommendations

This chapter addresses how to enable storage projects to mitigate system impacts within the review process through three sets of recommendations. First, the chapter recommends interconnection procedure language to require that the information provided to customers through the screening results data be sufficiently detailed to enable the customer to understand the constraints identified and, thereby, how a project may be modified to address the constraints. Second, the chapter provides examples of detailed screen and study results that utilities could use to relay useful data to the customer. Finally, the chapter recommends interconnection procedure language that would alter the Supplemental Review and study processes to allow the customer to act on the information provided by implementing DER design modifications.

1. Interconnection Procedures Should Be Revised to Provide More Data on Failed Screens

Several state interconnection rules provide some direction to the utility in terms of the content relayed to the customer when Fast Track screening results are delivered. Updated interconnection rules portray this directive in varying levels of detail.[80] These general guidelines often can be interpreted quite loosely and give a lot of leeway to the utility in terms of how much information is provided. This results in different approaches from different utilities and varying levels of information provided to the customer. More recent proposals to update interconnection procedures aim to give more specific guidance so that a minimum level of information is provided.[81] To ensure that the customer has enough information to make design

[80] Code MD Regs. 20.50.09.10.H (April 6, 2021) ("If the small generator facility is not approved under a Level 2 review, the utility shall provide the applicant written notification explaining its reasons for denying the interconnection request."); *New York Standardized Interconnection Requirements* (March 2021) I.C Step 4 ("…the utility shall provide the technical reasons, data and analysis supporting the Preliminary Screening Analysis results in writing.")

[81] IL Commerce Comm., Dkt. 20-0700, Amendment of 83 Ill. Adm. Code 466 and 83 Ill. Adm. Code 467, *Second Notice Order* (Aug. 12, 2021) 466.100.b.5.B ("If one or more screens are not passed, the EDC shall provide, in writing, the specific screens that the application failed, including the technical reason for failure. The EDC shall provide information

decisions, the rule should give as specific guidance as possible on what results should convey. Accordingly, it is recommended that the description of data and analyses (*e.g.*, SGIP 2.2 Initial Review) be revised to specify the level of detail that should be provided as follows:

> *Within 15 Business Days after the ~~Transmission~~ Distribution Provider notifies the Interconnection Customer it has received a complete Interconnection Request, the ~~Transmission~~ Distribution Provider shall perform an initial review using the screens set forth below, shall notify the Interconnection Customer of the results, and include with the notification copies of the analysis and data underlying the ~~Transmission~~ Distribution Provider's determinations under the screens. If one or more screens are not passed, the Distribution Provider shall provide, in writing, the specific screens that the Interconnection Request failed, including the technical reason for failure. The Distribution Provider shall provide information and detail about the specific system threshold or limitation causing the Interconnection Request to fail the screen.*

2. Screening Results Should Provide Relevant and Useful Data

Ideally, when Fast Track screen results are provided, full information about each screen would be given such that the customer would be able to ascertain exactly what changes to the DER system could allow it to pass the screen (and thereby avoid the need for upgrades). More helpful still may be to provide suggested design changes that would reduce interconnection hurdles. Utilities may believe, however, that the latter goes beyond their responsibility in the interconnection process and prefer to simply relay information.

The project team reviewed screening results from utilities in Hawaii, Illinois, Minnesota, and North Carolina to determine the range of data currently provided. The type and amount of data provided varied significantly, with some utilities providing a simple "pass" or "fail" for each screen and others providing more detailed data. Given the likelihood of data being available to the utility during the screening process, a list of preferable screen results data is presented in the recommendations. With the exception of proposed inadvertent export screen 2.2.1.3 and some of the data in Supplemental Review screen 2.4.4.2, this type of data has been provided by one or more of the utilities reviewed. Utilities should provide data for each screen when providing Fast Track results to the customer, as noted in Table 5 below. Additionally, some ideal screen result examples are provided following the table. Since utilities vary in their application of the Supplemental Review screens for voltage, power quality, and safety and reliability, full guidance cannot be given, but similarly detailed data should be provided for all screens applied.

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and detail about the specific system threshold or limitation causing the application to fail the screen."); MA Dept. of Pub. Util. Dkt. 19-55, *Massachusetts Joint Stakeholders Consensus Revisions to the Standards for Interconnection of Distributed Generation Tariff ("DG Interconnection Tariff") to Address the Interconnection of Energy Storage Systems* (Feb. 26, 2020) 3.3(e) ("If one or more Screens are not passed, the Company shall provide, in writing, the specific Screen(s) that the Application failed, including the technical reason for failure. The Company shall provide information and detail about the specific system threshold or limitation causing the Application to fail the Screen.").

Table 5. Data Provisions for Individual SGIP Screens

SGIP Screen		Description	Data to Provide
Initial Review	2.2.1.2	15% of annual section peak load (or 100% minimum load)	Load (peak or minimum), aggregate generation (or Export Capacity), and percentage of load. For interconnection rules that integrate time-based load data into the screening process, provide the minimum load time window.
	New screen	Inadvertent Export voltage change screen	Provide values in the equation: $\frac{(\boldsymbol{R}_{SOURCE} \times \Delta \boldsymbol{P}) - (\boldsymbol{X}_{SOURCE} \times \Delta \boldsymbol{Q})}{\boldsymbol{V}^2} = \Delta \boldsymbol{V}$
	2.2.1.3	Spot network (5% of network peak load or 50 kW)	Peak load, aggregate generation on network, and percentage of load.
	2.2.1.4	10% of maximum fault current	Aggregate generation fault current on circuit, distribution circuit max fault current, percentage of max fault current, assumptions for customer's DER (e.g., fault current = 1.2x inverter Nameplate Rating).
	2.2.1.5	87.5% of short circuit interrupting capability	Short circuit interrupting rating at limiting (lowest rated) equipment in-line with DER, aggregate DER fault current contribution, distribution circuit max fault current nearest PCC, total short circuit current, percentage of short circuit interrupting rating.
	2.2.1.6	Line configuration	Distribution line type, interconnection (customer service) type.
	2.2.1.7	Shared secondary transformer 20 kW	Aggregate DER rating (or export) on shared secondary, for screens that use 65% of transformer rating instead of 20 kW provide transformer rating and percentage of rating.
	2.2.1.8	Single-phase imbalance	Transformer rating, imbalance as percentage of rating.
	2.2.1.9	10 MVA transient stability	Aggregate generation, whether there are known transient stability limitations.
Supplemental Review	2.4.4.1	100% minimum load	Min load, aggregate generation (or export), percentage of load, time period under consideration (e.g., hours of the day based on fixed vs. tracking PV).
	2.4.4.2	Voltage and power quality	This list is not exhaustive and would be dependent on the applied criteria. E.g., if non-bidirectional regulators experiencing reverse flow: maximum reverse power at regulator; If overvoltage is flagged at minimum load: maximum reverse power with customer's DER, maximum reverse power before triggering voltage limit violation.
	2.4.4.3	Safety and reliability	This list is not exhaustive and would be dependent on the applied criteria. E.g., conductor loading: limiting conductor ampacity, total current, loading as a percentage of ampacity.
Covering all screens			kW of existing DER in-line section and DER ahead in queue.

The below examples contain screen language inclusive of the recommendations of Chapter IV.

Example: An Ideal 15% Screen Result

For interconnection of a proposed DER to a radial distribution circuit, the aggregated Export Capacity, including the proposed DER, on the circuit shall not exceed 15% of the line section annual peak load as most recently measured. A line section is that portion of a Distribution Provider's electric system connected to a customer bounded by automatic sectionalizing devices or the end of the distribution line.

Export Capacity of DER Application		kW
Export Capacity of Active DER on Feeder		kW
Export Capacity of DER ahead in Queue		kW
15% of Peak Load		kW
Aggregate Export Capacity, Including Proposed DER		kW
Export Capacity of DER, as % of Load		%
Passes Screen	No	

Example: An Ideal Shared Transformer Screen Result

If the proposed DER is to be interconnected on a single-phase shared secondary, the aggregate Export Capacity on the shared secondary, including the proposed DER, shall not exceed 20 kW or 65% of the transformer Nameplate Rating.

Export Capacity of DER Application		kW
Export Capacity of DER Active on Feeder		kW
Export Capacity of DER Ahead in Queue		kW
Export Capacity of Aggregate DER on Shared Secondary:		kW
Transformer Nameplate Rating:		kW
Export Capacity of Aggregate DER, as a % of Transformer Nameplate Rating:		%
Passes Screen	No	

Example: An Ideal Protection Screen Result

The fault current of the proposed DER, in aggregate with the fault current of other DER on the distribution circuit, shall not cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers) or Interconnection Customer equipment on the system to exceed 87.5% of the short circuit interrupting capability; nor shall interconnection be proposed for a circuit that already exceeds 87.5% of the short circuit interrupting capability.

Nameplate Rating of DER Application		kW
Nameplate Rating of DER Active on Feeder		kW
Nameplate Rating of DER Ahead in Queue		kW
Lowest Short Circuit Interrupting Rating of Equipment in Line with DER:		Amps
Aggregate DER Fault Current Contribution:		Amps
Distribution Circuit Maximum Fault Current Nearest the PCC:		Amps
Total Available Short Circuit Current		Amps
% of Short Circuit Interrupting Rating:		%
Passes Screen	Yes	

Example: An Ideal 100% Minimum Load Supplemental Review Result

Where 12 months of line section minimum load data (including onsite load but not station service load served by the proposed DER) are available, can be calculated, can be estimated from existing data, or determined from a power flow model, the aggregate Export Capacity on the line section shall be less than 100% of the minimum load for all line sections bounded by automatic sectionalizing devices upstream of the proposed DER. If minimum load data is not available, or cannot be calculated, estimated, or determined, the Distribution Provider shall include the reason(s) that it is unable to calculate, estimate, or determine minimum load in its Supplemental Review results notification.

Export Capacity of DER Application		kW
Export Capacity of DER Active on Feeder		kW
Export Capacity of DER Ahead in Queue		kW
Relevant Time Period	__ am/pm to __ am/pm	
Minimum Load		kW
Aggregate Export Capacity, Including Proposed DER		kW
DER as % of Load		%
Passes Screen	Yes	

3. Impact Study Results Should Provide Analysis of Alternate Options

System impact studies are much broader in scope and require more detailed analysis compared to the screening process. Identifying the universe of data and information to be provided in study results is therefore challenging and interconnection rules typically describe such results in broad terms. For instance, SGIP attachment 7 (system impact study agreement) states:

> A system impact study shall consist of a short circuit analysis, a stability analysis, a power flow analysis, voltage drop and flicker studies, protection and set point coordination studies, and grounding reviews, as necessary. A system impact study shall state the assumptions upon which it is based, state the results of the analyses, and provide the requirement or potential impediments to providing the requested interconnection service, including a preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses and implement the interconnection. A system impact study shall provide a list of facilities that are required as a result of the Interconnection Request and non-binding good faith estimates of cost responsibility and time to construct.

While the Impact Study is meant to analyze the impact of the DER system described in the application, developers may be interested in tailoring the DER to avoid or mitigate any distribution system constraints. Data about these constraints may be limited at the time of application, due either to lack of access to the type of information described in Chapter VI or effects from earlier-queued systems. In addition to the full study results which are normally provided, it would be useful to provide interconnection customers with an analysis of potential changes to the DER system which would eliminate or reduce the need for distribution system upgrades.

From the developer perspective, a transparent, collaborative process between the utility and developer that helps to refine the proposed DER design in a manner that maximizes the benefits to the customer while also benefitting, or at least minimizing the impact on, the distribution system would be ideal. A step in this direction, without completely revamping the interconnection process, would be to provide a limited analysis of alternative DER configurations. For efficiency, studying these alternative configurations would best be done during the normal timeframe of the study, rather than requiring restudy after the results are delivered. Some utilities regularly provide this type of analysis as part of the study results, though they vary in how that information is evaluated or presented. As discussed below in Chapter VII.C.6, this analysis can be guided by discussion between the utility and developer. As an example, a reduced Nameplate Rating or modified power factor (PF) setting may be noted as a less expensive solution to an identified upgrade. Below is an example table similar to that provided in one utility's study results and includes mitigations that address identified impacts.

Table 6. Example Study Results With Alternate Options

Upgrade Required	Option 1 X MW	Option 2 X MW @ 99% PF	Option 3 0.8*X MW	Failures Addressed
3VO Installation	$ 600,000	$ 600,000	$ 0	Overvoltage Transmission System Fault
Load Tap Changer Bi-Directional Co-Generation Capability	$ 0	$ 0	$ 30,000	Substation Regulation for Reverse Power
Supervisory Control and Data Acquisition (SCADA) With Direct Transfer Trip	$ 120,000	$ 120,000	$ 120,000	Unintentional Islanding
Existing Utility Recloser Upgrade	$ 60,000	$ 60,000	$ 60,000	Unintentional Islanding
Upgrade Voltage Regulator Controls	$ 15,000	$ 0	$ 0	High Voltage
Total	$ 795,000	$ 780,000	$ 210,000	

4. Processes Should Allow for Design Modifications to Mitigate Impacts

Interconnection customers may have various reasons to modify their projects during the interconnection process or after a project is already constructed (*e.g.*, certain equipment is no longer available in the marketplace forcing the customer to change the identified equipment, policy changes may necessitate design changes, or the project may want to mitigate impacts). Therefore, it is important to have well-documented sections in the interconnection rules that provide guidance on whether and how design changes can be accommodated.

Currently, many state interconnection procedures have one overarching section which addresses what type of modifications can be made and how they will be evaluated; this is typically known as the "Material Modification" process.[82] SGIP defines a material modification as any modification that may have "a material impact on the cost or timing of

[82] *See, e.g.*, *Minnesota Distributed Energy Resources Interconnection Procedures*, Section 1.6 (provides a process for identifying whether a proposed modification constitutes a material modification and specifies that modifications that are deemed to be material will require withdrawal of the interconnection application and resubmittal); *California Rule 21* table F.1 defines Type I modifications under the Fast-Track process, while section Ee defines Type II Modifications referring to existing facilities, and each provide descriptions of changes that require a new interconnection application and those that do not; MA Dept. of Pub. Util. Dkt. 19-55, *Hearing Officer Memorandum Announcing the Department of Public Utilities' Interim Guidance -- Energy Storage Systems II, ESS Decision Tree* (Feb. 28, 2020) provides interim guidance on DC- and AC-coupled systems that seek to add ESS after the initial interconnection application (https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/11862820).

any Interconnection Request with a later queue priority date." Some states include a specific list of the types of changes that are, or are not, considered material.[83] In general though, changes that would require a re-evaluation or restudy of a project, such as an increase in Export Capacity, extension of operating profile, or addition or removal of ESS, are typically deemed material and thus require submittal of a new interconnection application.

However, in order to enable DER system design to be altered to respond to screening or study results, it is necessary to create a separate process that enables certain changes that might otherwise be deemed material. These changes should be treated differently from modifications proposed at other points in the process, so long as they are proposed at a designated time following the screening or study process and are specifically tailored to mitigate identified impacts. Changes proposed at other times or for other reasons should be reviewed under existing material modifications provisions. The following sections recommend where these changes should be allowed during the screening and study processes.

5. Allowance for Design Changes After Supplemental Review

Having the information provided via screen results as described in section VII.C.2 above should give a developer an understanding of the grid constraints at that location if a screen is failed. However, according to SGIP and most interconnection procedures today, if a screen is failed and the utility cannot determine that the system can still be safely and reliably interconnected, the project must then proceed to Supplemental Review or full study. During the Supplemental Review process, additional screens are applied which may provide further detail on whether system upgrades are required and also provide an opportunity to identify if modifications might be made to address the identified constraints. Allowing for a short period of design change and review, as necessary, would help more projects move forward quickly with minimal effects on the queue. These changes could incorporate some material modifications yet still allow for review without withdrawal and resubmittal of the application.

The recommended language below allows projects to redesign the DER system within certain constraints during Supplemental Review. This would allow for changes such as a decrease in nameplate capacity or Export Capacity, or potentially changes to the operating schedule (where such can be evaluated during the Supplemental Review process). This approach is not included in Initial Review since the achievable timeline would not be significantly different compared to application withdrawal and resubmittal. Additionally, most states have conservative, non-detailed Initial Review screens. Thus, after application of the initial Fast Track screens, the customer will not yet have sufficient information about whether upgrades are indeed required, and correspondingly, what project modifications

[83] *See e.g., New York Standardized Interconnection Requirements*, p. 39 (March 2021) (definition of material modification includes examples).

may be needed or possible.[84] Thus, where states do include more detailed screens in Initial Review (*e.g.*, comparing the operating schedule to available capacity evaluated on a seasonal or monthly basis) then this approach could be applied effectively within Initial Review as well.

To amend the Supplemental Review process in response to screen failures (SGIP section 2.4.5), the following changes are recommended:

> *If the proposed interconnection passes the supplemental screens in sections 2.4.4.1, 2.4.4.2, and 2.4.4.3 above, the Interconnection Request shall be approved and the ~~Transmission~~ Distribution Provider will provide the Interconnection Customer with an executable interconnection agreement within the timeframes established in sections 2.4.5.1 and 2.4.5.2 below. If the proposed interconnection fails any of the supplemental review screens the Distribution Provider shall specify which screens the application failed, including the technical reason for failure, and the data and the analysis supporting the supplemental review. The Distribution Provider shall provide information and detail about the specific system threshold or limitation causing the Interconnection Request to fail the screen. If the Interconnection Customer chooses to amend the Interconnection Request to address the specific failed screens, the Interconnection Customer must submit an updated Interconnection Request demonstrating the redesign within ten Business Days after receiving the screen results. The redesign shall only include changes to address the screen failures or identified upgrades (which could include, for example, the addition of DC-coupled or AC-coupled energy storage). Increases in Export Capacity or changes in Point of Interconnection are not permitted and shall require the Interconnection Request to be withdrawn and resubmitted. The Distribution Provider will evaluate whether the redesign addresses the screen failure and notify the Interconnection Customer of the results of this evaluation within ten Business Days. This redesign option to mitigate impacts shall only be available one time during the Supplemental Review process. If ~~and~~ the Interconnection Customer does not amend or withdraw its Interconnection Request, it shall continue to be evaluated under the section 3 Study Process consistent with section 2.4.5.3 below.*

Commissions may want to require that the customer pay a fixed fee for the additional review, or require that a deposit on the actual costs of the review be provided by the customer.

[84] In response to failing the 15% of peak load screen (SGIP 2.2.1.2) as modified per the recommendations of Chapter IV, a customer could elect to install a non-exporting system. In response to failing the shared secondary transformer screen (SGIP 2.2.1.7) as modified per Chapter IV, a customer could elect to reduce Export Capacity.

6. Allowance for Design Changes Within Full Study

a. Study Options

As mentioned in VII.C.3 above, it is helpful for alternate configurations to be evaluated during the Impact Study, such that a developer can choose to reduce interconnection costs with modifications to the initial DER design that have already been evaluated by the utility. Since the utility will have studied the alternate configurations already, this should allow the developer to avoid further study and move straight to an interconnection agreement as long as they agree to change the design in line with the options that were studied.

During the scoping meeting, the developer should indicate the types of DER system changes they would be open to considering. For utilities that can evaluate an operating schedule as discussed in Chapter IX, a reduction in Export Capacity for certain hours of the year could be considered. This would help a developer take advantage of an ESS's customizable nature, designing around constraints that may exist for only a small portion of the year (for example, low loading).

It is recommended that the developer and utility agree during the scoping meeting to evaluate up to three different options, one being the original design (or as agreed to be modified during the scoping meeting). The other two options could contain a number of changes to system parameters such as, but not limited to:

- Reduction in Nameplate Rating or Export Capacity
- Modification to DER voltage regulation
- Operating profile modification (*e.g.*, a fixed discharge/export schedule or a reduction in Export Capacity for certain hours of the year)
- Dynamic control (*e.g.*, commanded curtailment)

The utility should indicate how each type of alternate DER design can be incorporated into the study. It is recommended that the analysis of alternate designs be memorialized in the system impact study agreement (*e.g.*, SGIP Attachment 7), though flexibility to change alternate options through mutual agreement should be maintained as the study is underway.

While these types of analyses are not required by interconnection rules today, it may be beneficial for Commissions to explore if and how such practices could be harmonized and codified.

Design modification outside of those options already evaluated may require further study and can be accommodated by the process set forth below.

b. Post-Results Modifications

Due to high interconnection cost estimates, even within the options studied per the previous discussion, modifications to the DER system outside the alternate options may be desired. A process for modifications in the study process, similar to that proposed above for Fast Track projects, is desirable and will help ESS projects move forward with changes

to system design or a modified operating profile. Most interconnection rules already include some measure for allowing changes deemed "non-material," but it is recommended that an explicit process be defined for modifications after study results are delivered.[85]

It is recommended that a new section be added to the interconnection rules, such as a new section 3.4.10 for SGIP, as follows.

> *3.4.10 A one-time modification of the Interconnection Request is allowed as a result of information from the system impact study report. If the Interconnection Customer chooses to amend the Interconnection Request to address the specific system impacts, the Interconnection Customer must submit an updated Interconnection Request demonstrating the redesign within fifteen Business Days after receiving the system impact study results from the Distribution Provider under section 3.5.1. The redesign shall only include changes designed to address the specific system impacts or identified upgrades (which could include, for example, the addition of DC-coupled or AC-coupled energy storage). This redesign option to mitigate impacts shall only be available one time during the Study Process. Increases in Export Capacity or changes in Point of Interconnection are not permitted and shall require the Interconnection Request to be withdrawn and resubmitted.*
>
> *The Distribution Provider shall notify the Interconnecting Customer within ten Business Days of receipt of the modified Interconnection Request if any additional information is needed. If additional information is needed or document corrections are required, the Interconnection Customer shall provide the required information or corrections within ten Business Days from receipt of the Distribution Provider notice.*
>
> *The actual costs to Distribution Provider for any necessary restudies as a result of a modification described above shall be paid by the Interconnection Customer. Such restudies should be limited to the impacts of the modification and shall be billed to the Interconnection Customer at cost and not for work previously completed. The Distribution Provider shall use reasonable efforts to limit the scope of such restudies to what is necessary. The revised impact study shall be completed within fifteen business days.*

[85] For example, Maine Chapter 324 section 12(D)(1) specifies this type of modification specific to the full study (Level 4) process.