Southern California Edison
Rule 21 Storage Charging Interconnection
Load Process Guide

Version 1.1

October 21, 2016
Introduction & Applicability

Energy storage Interconnection Requests require that storage projects be studied both as an electrical source (Generator) and as an electrical load (Load) to ensure that the Distribution System and SCE’s electrical service facilities to the customer are capable of operating safely and reliably under both operating conditions.

This Storage Charging Interconnection Load Process Guide (Load Guide) provides an overview of the study and processing details related to the charging/load aspects of an energy storage Interconnection Request.

The study and interconnection of CPUC-jurisdictional generation (including energy storage operating in charge or discharge mode) is governed under SCE’s Tariff Rule 21, while the study of load is governed under SCE’s Tariff Rules 2, 3, 15 and 16 (Load Tariffs). The Load Guide is developed for Interconnection Customers and stakeholders as a reference to the interaction of the Load Tariffs with the Rule 21 interconnection process.¹ In the event of any conflict between this document and Rule 21 or other tariffs, the tariff rules will govern. In addition, specific technical electrical interconnection requirements are governed within SCE’s Interconnection Handbook and Electrical Service Requirements and are not addressed within this Load Guide.

In accordance with Decision (D.)16-06-052 Attachment C (Modifications for Streamlining and Standardizing the Interconnection Process for Behind-the-Meter, Non-Exporting Energy Storage), the Load Guide addresses the following items:

1) Process and supporting implementation detail by which load aspects of energy storage are reviewed, including specific size thresholds and cost responsibility of load-related impacts.
2) Description of any specific requirements for cursory load review.
3) Information that will be provided by SCE as a result of a load study, including proposed charging profiles to avoid identified system upgrades.²
4) Stakeholder modification process for future revisions to the Load Guide (as required).

As illustrated in Figure 1, below, four primary phases govern the basic interconnection process:

1. Application Processing
2. Technical Studies
3. Agreement Execution
4. Project Implementation

¹ The process described in Section B highlights when a “cursory load review” would be expected based on system size and operating characteristics.
² See Sections B and C.
This Load Guide focuses on the aspects related to the study of load/charging impacts, primarily associated with, and during, phases 1, 2 and 3 of the interconnection process. Project implementation for projects that include both work for both load and generation in phase 4 will be coordinated together by SCE but is not the focus of this Load Guide as it does not involve the load study process and supporting details.

A. Application Processing

During the Interconnection Application processing, load charging characteristics will be identified by the Interconnection Customer within SCE’s Interconnection Application, as follows:

1. Energy Storage Charging Functions:
   1) Rated Charging Demand (Load): _____________ kW
   2) Estimated annual Net Energy Usage of energy storage device(s)___________kWh
   3) Will the Distribution System be used to charge the storage device: Yes/No
      a. If No: Provide technical description of control system including:
         i. Source of energy for charging:
         ii. Mechanism to prevent charging from the Distribution System:
      b. If Yes: Will charging the storage device(s) increase the host facility’s existing peak load demand (Yes/No)
         i. If Yes, Provide the following loading information:
            1. Amount of added peak demand:
         ii. If No, Provide technical description of control systems including:
            1. Charging periods: _____________________
            2. Mechanism to prevent charging from the Distribution System during host facility peak:

When an interconnection application for storage is deemed complete, the review and study phases commence in accordance with tariff requirements. As operation of the storage system in discharging mode (generation) and charging mode (load) may have different impacts to the SCE service facilities or Distribution System, and may be governed by different rules, the project may be studied in two parallel paths (Path 1 - Generation, Path 2 - Load). Upon completion of the determination of the project impacts in each respective path, the results will be reconciled/overlaid for duplication prior to proceeding to agreement processing or construction as represented in the diagram below.

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3 If no grid charging is selected, this selection would be viewed as Operational Mode 1.
4 If the charging will not increase the host facility’s existing peak load demand, this selection would be viewed as Operational Mode 2.
5 If unrestricted charging is requested, charging functionality should be noted within the Energy Storage functions.
6 See generally Rule 21 Fast Track and Detailed Study Review Processes (Section F).
B. Operational Modes Associated with Charging and Study Expectations

In the initial steps of the load study, based on the responses provided within the interconnection application, charging will be categorized as one of three modes:

Mode 1: No Grid Charging – This mode of operation involves storage that is coupled with on-site generation, such that the storage system is charged without the use of SCE’s Distribution System. Under this mode, the energy storage system will charge exclusively from the on-site generation. As such, operation of the storage system in this mode will not cause an increase to the customer’s load demand from the SCE Distribution System and a load review will not generally be required. The applicant will need to describe how the project is interconnected and/or controlled in order to review that the proposed project will charge exclusively from an electrical source other than SCE’s Distribution System. SCE will still review the storage discharging characteristics (generation) for any impacts resulting from the storage system when operating as physically connected to SCE’s Distribution System. These impacts are evaluated according to the study process for generation as detailed in Rule 21.

Mode 2: Peak Shaving – This mode of operation involves storage that is charged from SCE’s Distribution System under “certain” or “limited” conditions. Under this mode, the storage system discharges during times of customer peak load with the intent of reducing the net instantaneous load served by SCE’s Distribution System. For storage systems that don’t cause the total facility load to exceed recent historical peak demand, the impact on the existing SCE Distribution System is expected to be minimal. The applicant will need to describe how charging is controlled. Options might include programming the storage device to charge only when site loads are minimal, monitoring total facility power flows and controlling the charging accordingly etc. SCE will still review the storage discharging characteristics (generation) for any impacts resulting from the storage system when operating as physically connected to SCE’s Distribution System. These impacts are evaluated according to the study process for generation as detailed in Rule 21.

Mode 3: Unrestricted Charging - This mode of operation involves storage that can charge from SCE’s Distribution system at any time, regardless of other facility loads. This mode may be the most flexible for the customer but will have more potential to impact SCE’s service facilities to the customer and SCE’s Distribution System, as compared to Modes 1 and 2. SCE’s review of this type of application will include studies of both the storage system’s load (charging) characteristics as well as the generation (discharging) characteristics to determine impacts to SCE’s portion of the customer’s electric service and SCE’s Distribution System. Because the storage device is a
new, additional load on SCE’s Distribution System, this mode of operation requires more rigorous review for impacts to the Distribution System and has a higher likelihood of requiring upgrades to SCE load service facilities. Unrestricted charging may also impact retail billing charges. To avoid unnecessary costs, SCE recommends that customers only request this service when needed. The customer always has the option to upgrade the service at a later time to meet future needs. The load review process to safely accommodate this mode may be longer as discussed under Load Study and Operating Mode impacts.

**Load Study & Operation Mode Impacts**

The selected charging mode, as described above, along with other details provided by the Interconnection Customer in the interconnection application will determine the level of review and study needed during the Load Study phase shown below in Table 1.

Regardless of the operating mode, SCE will review each application for the impact of:
1. Additional load on the Distribution System, and
2. Operation of the storage system on the Distribution System (e.g., voltage, flicker, electrical fault duty, etc.).

During the Load Study, the operational mode and size will be primary factors in determining the level of load-related review and study required for the charging aspects of the project. The primary anticipated Load Study work would be as follows:

1) **Mode 1** - Based on the application, this mode involves no charging from the Distribution System; hence, SCE would not perform a load/charging study on its service facilities or Distribution System and the review would be limited to verification of the proposed project’s configuration/mechanism to charge exclusively from on-site generation, preventing any charging from SCE’s Distribution System. As noted above, SCE will still review the storage discharging characteristics (generation) for any impacts resulting from the storage system while operating as physically connected to SCE’s Distribution System. These impacts are evaluated according to the study process as detailed in Rule 21, which is not repeated in this Load Guide.

2) **Mode 2** - Based on the application, this mode assumes peak shaving charging behavior with controlled charging from the Distribution System. SCE’s review of this type of application will include a study of both the storage device’s load (charging) characteristics as well as the discharging (generation) characteristics. Charging is expected to be completed during the Fast Track Rule 21 process for projects as described in Table 1 below (projects that qualify under the Tier 1 cursory review and Tier 2 quick review). The applicant will need to provide written descriptions and provide technical documentation to demonstrate how the storage system will be operated under this mode within the application. SCE expects that for large projects see Table 1 for project voltage/sizes) operated under this mode, SCE may need additional time to review the charging impacts to the system. This is done to ensure that the customer can achieve its goal of peak shaving without inadvertently causing an issue on the system. The discharging (generation) characteristics will be based on Rule 21 procedures.

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7 See Section B – Application Form Requirements. As reflected within Table 1, a Tier 1 review would be expected to consist of only a customer facility “cursory review.”

8 Standard tariff rules for new load require the customer to notify the utility of the load and its characteristics even when associated with generation interconnection. Nothing described herein eliminates or alters that requirement.

9 See footnote 7 for “cursory review.” A Tier 2 “quick review” review described within Table 1 below could also include a review for coincidental peak but is also expected to be completed in parallel within the Rule 21 Fast Track process timelines.
3) **Mode 3** – Storage systems operating in this mode are anticipated to have impacts that are seen as new and additional load on the SCE Distribution System and/or SCE service facilities as a result of charging at any time. These projects require more detailed and rigorous review and study of impacts to the SCE service facilities to the customer panel and/or SCE’s Distribution System to ensure adequate service capacity for unrestricted charging with no impacts to safety and reliability including things like harmonics, voltage flicker from starting, etc. These projects have the highest likelihood of requiring upgrades to SCE service facilities and Distribution System. The load review process for this operating mode is expected to be longer than the review times under Tier 1 and 2 of Table 1 below to ensure safety and/or reliability of the Distribution System and clarify any required upgrades to service facilities or the Distribution System. The type of review and study to be performed under the unrestricted mode will be dependent on the size of the proposed storage facility as well as the system to which it will be connected as shown below in Table 1. It should be noted that the Tier 2 Quick Review shown in Table 1 may lead to the more extensive Detailed Load Study review depending on the system loading conditions and load forecasting in the area. SCE expects to provide an update as to load review status at the completion of the generation Rule 21 Fast Track process (if additional time is required).

<table>
<thead>
<tr>
<th>Table 1 – General Limits Triggering Levels of Review &amp; Study</th>
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</thead>
<tbody>
<tr>
<td><strong>Tier 1 - Electrical Service Cursory Load Review</strong></td>
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<tr>
<td>System Voltage &lt;5KV – 0kVA to 100 KVA</td>
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<tr>
<td>System Voltage &gt;5KV – 0kVA to 250 KVA</td>
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<tr>
<td><strong>Tier 2 - Electrical Service &amp; Distribution System Quick Load Review</strong></td>
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<tr>
<td>System Voltage &lt;5KV – 100KVA to 250 KVA</td>
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<tr>
<td>System Voltage &gt;5KV - 250KVA to 1000 KVA</td>
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<tr>
<td><strong>Tier 3 - Detailed Load Review</strong></td>
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<tr>
<td>System Voltage &lt;5KV – Greater than 250KVA</td>
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<tr>
<td>System Voltage &gt;5KV – Greater than 1000KVA</td>
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</table>

C. **Interconnection Agreement Representations:**

If, during the technical studies, operational constraints are identified in lieu of upgrades, the following language will be included in the Interconnection Agreement (IA):10

For the annual period between _______________ [Month/Day] and _______________ [Month/Day]

And during the hours of ________________________________

The storage device(s) will consume no more than a total of ___ kW from the Distribution System.

This operating constraint voids the need for the following specific mitigation scope:

These operating requirements are determined during the study process and are detailed in the study report. These requirements, including any commitment by the Interconnection Applicant to operate in

10 See Advice 3448-E, Modifications to Southern California Edison Company’s Interconnection Applications and Agreements Associated With Rule 21 to Capture Load-Related Information Pursuant to Decision 16-06-052, dated August 8, 2016.
Mode 1 or 2, are then memorialized in the IA.\textsuperscript{11} If upgrades related to charging activities are identified, the cost allocation will be applied in a manner consistent with Sections D and a reconcilement summary will be prepared by SCE with identification of generation vs. load upgrades.

\textbf{D. Upgrades Attributable to Both Load and Generation System Impacts and Supporting Cost Allocation – Illustrative Examples}

As shown in Figures 1 and 2, the load and generation studies will be performed independently. Each of these studies may determine upgrades or modifications needed to the SCE Distribution System or service facilities. Some upgrades or modifications required for the generating mode may overlap with upgrades required for load (charging).

The upgrades for load will be considered first and treated pursuant to the Load Tariffs.\textsuperscript{12} As such, Customers may be entitled to allowances if charging from retail rate tariffs. Incremental costs for generation-driven facilities that extend beyond those required for load will be treated pursuant to Rule 21. \textit{Note} - Unused load allowances will not be applied to facilities required pursuant to Rule 21.

Examples:

- Existing customer A has a 300 kW load and installs a non-export battery system that will charge from the Distribution System and increase the facility peak load to 500 kW. As the project is non-export, the generation study does not identify any upgrades pursuant to Rule 21. However, the load study determines that as the result of the new load, the service line needs to be replaced. The line replacement will be done pursuant to the Load Tariffs. Allowances, if any, will be determined based on the net incremental load increase and the customer will have cost responsibility for any balance.

- Existing customer B has a 2000 kW load and installs a 1500 kW non-export battery system that will charge from the Distribution System and increase the facility peak load to 3500 kW. The load study identifies no upgrades required to the service facilities or the Distribution System. While the project is non-export and the generation study does not identify any power flow upgrades, it does identify that the generation requires telemetry. The telemetry will be installed pursuant to Rule 21 as Interconnection Facilities with the customer having cost responsibility.

\textbf{D. Stakeholder Load Guide Modification Process}

This portion of the Load Guide describes the process that SCE will follow to update the contents of this Load Guide.

The objectives of the Load Guide revision process are:

1. Create a forum for SCE and stakeholders to provide input and foster understanding of the respective viewpoints regarding the Load Guide;
2. Communicate participants’ proposals in a transparent manner;
3. Document SCE’s revisions to the Load Guide, including feedback from stakeholder comments;

\textsuperscript{11} \textit{Id.}
\textsuperscript{12} \textit{Id.} For retail customers interconnecting energy storage devices pursuant to Rule 21, the load aspects of the storage devices will be just like any other load, using the incremental net load for non-residential customers, if any, of the storage device.
4. Describe the communication protocol among all parties participating in revisions of the Load Guide, including the use of tools like e-mail, meetings, conference calls, and the exchange of written documents.

A list of interested parties with email contact information will be maintained by SCE for purposes of notices pertaining to this Load Guide. Initially, this list will be composed of the parties on the R.11-09-011 Service List.

Any party may add themselves to the Load Guide mailing list by emailing their contact information to the designated inbox (see next section).

a. Submittal of a Proposed Revision Request (PRR)

A request to make any change to the Load Guide, including any addition, edit, deletion, revision, or clarification, must be initiated by the submittal of a Proposed Revision Request (PRR) to SCE at interconnectionQA@sce.com

The PRR shall include the following information:

1. Description of requested revision;
2. Reason for the suggested change (including a statement of why the change/revision is necessary);
3. Impacts and benefits of the suggested change on the customers to which this Load Guide applies;
4. List of section(s) and subsection(s) of the Load Guide affected by the PRR;
5. General administrative information regarding the requester (organization, contact name, etc.); and,
6. Suggested language for the requested revision.

b. PRR Review and Comment

Once a PRR is submitted, SCE will review the PRR for accuracy, completeness and applicability. SCE may contact the entity who submitted the PRR to clarify the PRR or to request any additional supporting documentation. The disposition of the PRR will be placed on the stakeholder review meeting agenda discussed below.

Based on the scope of the PRR, and the reasons or documentation supporting it, SCE can either (i) accept the PRR for review or (ii) reject the PRR. If the PRR is rejected, SCE will communicate to the submitter the reasons why the PRR was rejected.

c. Stakeholder Review Meeting to Discuss PRR

SCE will convene a Stakeholder Review Meeting on as-needed basis (up to two calls per year (first and third quarter) to summarize any PRRs during the prior period with all interested stakeholders. Notice of this meeting will be given to the Load Guide distribution list ten (10) business days prior to the call. For efficiency purposes, stakeholder involvement for revisions to this Load Guide may be scheduled concurrently with stakeholder involvement activities for other aspects of Rule 21. In such cases, any noticing will clearly indicate the multiple topics to be covered.
E. Other SCE Rule 21 Interconnection Resources for Reference

Additional information regarding Rule 21 interconnection can be located at www.sce.com at Interconnection Generation under Rule 21. Under this topic heading, additional search options include the following:

- Information Available Prior to Requesting for Interconnection under Rule 21
- Rule 21 Optional Pre-Application Report Request
- Information for Non-Exporting Projects
- Initiating a Request for Interconnection under Rule 21 for Exporting Projects
- Rule 21 Review/Study Tracks
- Fast Track Process Under Rule 21
- Detailed Study Process Under Rule 21
- Rule 21 Distribution Group Study Application Window

Additional questions can also be sent to interconnectionQA@sce.com.

F. Terms

Terms not already defined within the Load Guide should be viewed as consistent with Rule 21 Definitions (Section C).