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| Key Topic Concept (KTC) Number | 13 | KTC Title | Self-Limiting Issues Related to Interconnection Requests for Energy Storage Resources |
| Date Posted | February 28, 2020 |
|  |  |
| Executive Summary | A Self-Limiting generation site is described as a combination of one or more Generation Resources combined with energy storage system behind a single Point of Interconnection, where the sum of the capacity of the generation and the energy storage system is greater than either the maximum power export (Pmax) rating as established in the Interconnection Agreement, or the inverter rating. Similar consideration may also apply to maximum power withdrawal (Pmin).In these cases the Qualified Scheduling Entity (QSE) representing the Self-Limiting generation site bears the responsibility of ensuring that energy exports from the generation site do not exceed the Pmax and energy withdrawal from the grid does not exceed the Pmin. |
| Recommendation Description | QSEs should manage the performance of a Self-Limiting generation site to as not to exceed the established Pmax or withdraw from the grid more than the established maximum withdrawal (Pmin). |
| BESTF Discussion  | At the 01/17/2020 and 02/25/2020 meeting of the Battery Energy Storage Task Force (BESTF), ERCOT presented the outlines of a [proposed approach](http://www.ercot.com/calendar/2020/2/25/191190-BESTF) for accommodating Self-Limiting generation sites.  |
| TAC Action Requested | None at this time. |
| TAC Action Summary |  |

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| Proposed KTC Recommendation Language |

# *Key Topic/Concept recommendation Language for TAC Approval*

None.

# *Key Topic/Concept recommendation Language Previously APProved by tac*

None.

# *Key Topic/Concept recommendation Language IN DISCUSSION AT BESTF*

1. Assumptions for Self-Limiting generation site
	1. The addition of energy storage system to an existing generation site that is not intended to increase amount of MW that can be injected at the Point of Interconnection (POI). The maximum power export rating (Pmax) at the POI as established in the Interconnection Agreement (IA) does not change.
	2. New energy storage system is co-located with one or more Generation Resources where the Pmax in the IA is lower than the total installed MW capacity behind the POI.
	3. Total installed AC/DC MW capacity behind the POI may exceed either the inverter rating or the Pmax in the IA, but the power injected into ERCOT grid will always be limited to the Pmax in the IA.
	4. As a part of the Generation Interconnection (GINR) process, the Interconnecting Entity (IE) shall provide to ERCOT all details of the physically-limiting elements (e.g. inverters, Generation Step-Up transformers etc.) and/or the controller(s) settings at the combined facility that will enforce the limit. A TSP may install additional schemes to ensure adequate protection.
	5. Analogous assumptions and requirements apply for a Self-limiting generation site that intends to limit the energy withdrawal from the grid to a certain Pmin which is less than total withdrawal capability of the Self-limiting generation site.
2. Compliance and Monitoring program for Self-Limiting generation site
	1. During commissioning, the IE will be required to demonstrate that it has installed a generation limiting scheme that ensures the Self-Limiting generation site’s output will not exceed its total Pmax and/or withdrawal will not exceed its total Pmin. Such generation limiting scheme can be in the form of an attestation from the QSE operating the Self-Limiting generation site.
	2. The Pmax and Pmin of the Self-Limiting generation site shall be provided to ERCOT.
	3. After-the-fact review and reporting and/or “real-time alarms” will be implemented by ERCOT to monitor its generation and withdrawal levels compared to its self-limiting Pmax and Pmin.
	4. A Self-Limiting generation site that exceeds its established and studied IA Pmax (max injection) or operates below its established and studied Pmin (maximum withdrawal from the grid) shall be reported to the Public Utility Commission of Texas (PUCT) and will additionally be required to go through the interconnection process again for its total installed MW capacity. ERCOT will use meter data from the generation site for final determination of violation of Self-Limiting Pmax or Pmin.
3. Real-Time Telemetry and COP requirements
	1. QSEs shall be responsible for limiting their combined COP HSL and LSL, telemetered HSL and LSL, and total generation exports into or withdrawals from the ERCOT grid in order to avoid exceeding their IA Pmax or operating below their Pmin.
	2. QSEs are responsible for bringing additional generating unit(s) or any reactive power compensation equipment online to provide VSS if the Energy Storage System (ESS) alone is not capable of meeting its reactive power requirement at the POI (leading/ lagging power factor of 0.95).
4. GINR Pmax study for a DC-Coupled Resource (Example)
	1. An IE wants to add a new DC-Coupled Resource by installing 250 MW of PV and 200 MW of energy storage connected to ERCOT grid using shared inverters with a total rating of 250 MW
	2. Inverter rating will ensure 250 MW will be the maximum this facility can export to the ERCOT grid
	3. Under today’s rules, GINR process requires registration and studies for this facility at 450 MW Pmax
	4. The IE should be able to register this facility at 250 MW Pmax and the GINR studies should be conducted at 250 MW.
	5. Reactive requirements should be based on 250 MW Pmax.
5. Resource Adequacy Reporting
	1. Resource Adequacy reporting should consider the Self-Limiting generation site’s Pmax.
	2. QSE shall provide to ERCOT the generation site’s self-limited Pmax.
	3. ERCOT together with the Supply Analysis Working Group (SAWG) will develop a methodology to account for self-limiting generation site in resource adequacy reports, including the CDR and SARA.
6. GINR Process: Adding a battery to an existing PVGR or WGR site and sharing the existing inverter (DC-Coupled) - No Grid Charging

The GINR Process for adding a battery to an existing PV/WGR site and sharing the existing inverter (DC-Coupled) without the ability to charge the battery from ERCOT grid is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes, under Column C. The average estimated timeline for the GINR process is described under Appendix A, Figure 1 GINR Process Timeline.

1. GINR Process- Adding a battery to an existing PV/WGR site and sharing the existing inverter (DC-Coupled)(Column B) – With Grid Charging

The GINR Process for adding a battery to an existing PVGR or WGR site and sharing the existing inverter (DC-Coupled) with the ability to charge the battery from ERCOT grid is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes under Column B. The average estimated timeline for the GINR process is described under Appendix A, Figure 2 GINR Process Timeline.

1. GINR Process- Adding battery to existing thermal generation site (AC Coupled)

The GINR Process for adding a battery to an existing thermal site (AC Coupled) with the ability to charge the battery from the ERCOT grid is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes under Column A. The average estimated timeline for the GINR process is described under Appendix A, Figure 3 GINR Process Timeline.

1. GINR Process- Adding battery to existing PV/WGR site (AC Coupled)

The GINR Process for adding a battery to an existing thermal site (AC Coupled) with the ability to charge the battery from ERCOT grid is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes Column A. The average estimated timeline for the GINR process is described under Appendix A, Figure 3 GINR Process Timeline.

1. GINR Process - New DC-Coupled Resource

The GINR Process for adding a new DC-Coupled Resource is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes under Column G. The average estimated timeline for the GINR process is described under Appendix A, Figure 4 GINR Process Timeline.

1. GINR Process - New AC-Coupled Resource (Column H)

The GINR Process for adding a new AC-Coupled Resource is described in Appendix B, Table 1 Generation Interconnection Process for Swim Lanes under Column H. The average estimated timeline for the GINR process is described under Appendix A, Figure 5 GINR Process Timeline.

# *Future Decision Points and Issues for Developing Key topic/Concept recommendation Language*

None.

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| --- | --- |
| Applicable Protocol Section(s) |  |
| Impacted System(s) / Application(s) |  |

# Appendix A

In the following Figures 1 to 5, the base GINR process timeline is used to show the current GINR timeline. The base timeline is then modified to show the information from Table 1 for the applicable swim lane column. For example, in Table 1, column C, the Screening Study is marked as “No”. To show this in Figure 1, the text for “SS Complete” is struck out (“~~SS Complete~~”). Entries in Table 1 that are “Yes” would not be struck out in Figures 1 to 5.

Footnotes and Yellow cell text modifiers in Table 1 are shown in Figures 1 to 5 as red text. For example, footnote 9 in Table 1 is shown in Figure 1 with red text “Interim update may be acceptable” for RARF Submission.

## KTC 13.6 GINR Process- Adding battery to existing PV/WGR site and sharing the existing inverter (DC-Coupled) (Column C) - No Grid Charging



Figure 1 GINR Process Timeline

## KTC 13.7 GINR Process- Adding battery to existing PV/WGR site and sharing the existing inverter (DC-Coupled) (Column B) - With Grid Charging



Figure 2 GINR Process Timeline

## KTC 13.8 GINR Process- Adding battery to existing thermal site (AC Coupled) (Column A)

## KTC 13.9 GINR Process- Adding battery to existing PV/WGR site (AC Coupled) (Column A)



Figure 3 GINR Process Timeline

## KTC 13.10 GINR Process - New DC Coupled Resource (Column G)



Figure 4 GINR Process Timeline

## KTC 13.11 GINR Process - New AC Coupled Resource (Column H)

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Figure 5 GINR Process Timeline

# Appendix B

Table 1 Generation Interconnection Process for Swim Lanes

|  |  | **Add ESS to Existing Resource with Self-Limit** | **New Large Generator** | **New Small Generator** |
| --- | --- | --- | --- | --- |
| **GINR Phase** | **GINR Milestones and Studies** | **Adding ESS to the existing Site (AC Coupled1)** | **Adding ESS to Existing Solar with Grid Charging (DC Coupled)** | **Adding ESS to Existing Solar w/o Grid Charging (DC Coupled with no inverter changes)** | **Regular – meeting 5.1.1(1)(a)** | **Repower – relating to 5.1.1 (1)(b)(ii)** | **Self-Limiting single Resource meeting 5.1.1(1)(a)** | **DC Coupled – self-limiting multiple resources using same inverters - PG change needed** | **AC Coupled – self-limiting multiple resources with separate inverters – PG change needed****[[1]](#footnote-1)** | **Transmission Connected <10 MW GR- PG change needed****Transmission Connected <10 MW SO- PG change needed****Distribution Connected GR - PG change in progress****Distribution Connected SO - PG change needed** |
|  | Column Identifier | A | B | C | D | E | F | G | H | I |
| Interconnection Request Application to QSA | GINR Application and Fees | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Security Screening Study  | NO | NO | NO | YES | YES3 | YES[[2]](#footnote-2) | YES2 | YES2 | NO |
| Full Interconnection Studies | SS at Pmin, SC, Stability | SS at Pmin, Stability as needed | NO | YES | YES[[3]](#footnote-3) | YES2 | YES2 | YES2 | NO |
| Sub-synchronous Resonance Study | YES | YES as needed | NO | YES | YES | YES | YES | YES | NO |
| Standard Gen IA  | YES | YES | YES | YES | YES | YES2 | YES2 | YES2 | NO |
| Resource Asset Registration Forms | YES | YES | NO | YES | YES | YES[[4]](#footnote-4) | YES4 | YES[[5]](#footnote-5) | YES |
| Compliance with Operational Standards  | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Reactive Study | YES[[6]](#footnote-6) | YES | NO | YES | YES | YES[[7]](#footnote-7) | YES6 | YES | NO |
| Quarterly Stability Assessments | YES | YES as needed | NO | YES | YES | YES | YES | YES | NO |
| Registration and Modeling | RE Registration | NO[[8]](#footnote-8) | NO7 | NO7 | YES | YES | YES | YES | YES1 | YES |
| RARF/RIOO | YES5 | YES5 | YES | YES | YES | YES | YES9 | YES5 | YES |
| Network Modeling Requirements | YES5 | YES5 | YES[[9]](#footnote-9) | YES | YES | YES[[10]](#footnote-10) | YES9 | YES5 | YES |
| ERCOT Polled-Settlement Meters | YES[[11]](#footnote-11) | YES11  | NO | YES | YES | YES | YES[[12]](#footnote-12) | YES | YES |
| ESI ID Requirements | NO | NO | NO | YES | YES | YES | YES | YES | YES |
| Telemetry and ICCP Requirements | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Energization, Synchronization & Commissioning | Request to Energize POI | YES | YES | NO | YES | NO | YES | YES | YES | YES |
| **Streamlined[[13]](#footnote-13)** Commissioning Plan Template | YES | YES | YES[[14]](#footnote-14) | NO | NO | NO | NO | NO | NO |
| **Streamlined** New Generator Commissioning Checklist | YES | YES | YES | NO | NO | NO | NO | NO | NO |
| Part 1: Request to Commission a Point of Interconnection (**Streamlined)** | YES | YES | N/A | NO | NO | NO | NO | NO | NO |
| Part 2: Request for Initial Synchronization (**Streamlined)** | YES | YES | N/A | NO | NO | NO | NO | NO | NO |
| Part 3: Request to Commission a Resource **(Streamlined)** | YES | YES | N/A | NO | NO | NO | NO | NO | NO |

1. IE must submit attestation and details of the physically-limiting elements or power plant controller that will enforce limit [↑](#footnote-ref-1)
2. MW capability based on HRL or physically-limiting elements/power plant controller [↑](#footnote-ref-2)
3. Screening and Steady State studies may not be necessary if MW change is less than 10 MW [↑](#footnote-ref-3)
4. Full capability will be modeled everywhere except HRL which will reflect the self-limiting value [↑](#footnote-ref-4)
5. Full capability will be modeled everywhere [↑](#footnote-ref-5)
6. Reactive Study is needed if an existing site is IRR, maybe not needed if thermal [↑](#footnote-ref-6)
7. Reactive capability requirement based on self-limit entered as HRL [↑](#footnote-ref-7)
8. RE should already be registered. Only the new resource will need to be registered. [↑](#footnote-ref-8)
9. Interim update possibility since a new separate unit does not need to be modeled [↑](#footnote-ref-9)
10. Full capability of all units required except for HRL [↑](#footnote-ref-10)
11. If WSL treatment is requested. [↑](#footnote-ref-11)
12. WSL treatment not allowed due to lack of DC ANSI approved meters [↑](#footnote-ref-12)
13. Streamlined is defined as “undetermined subset of current commissioning process” [↑](#footnote-ref-13)
14. All that needs to be captured/commissioned is new telemetry from battery, otherwise this shouldn’t look any different that an solar farm changing out some solar panels [↑](#footnote-ref-14)