Rule 5.500 Interconnection

—

Revisiting Ride-through

vermont electric power company

VELCO

Operating Committee

August 18, 2016

PSB Rule 5.500 background

- Current rule adopted 2006
  - Modeled on FERC Small Generator Interconnection Agreement (SGIA)
  - Governs generator interconnections not under FERC jurisdiction (which interconnect thru ISO-NE)
  - Net metering interconnections addressed separately in Rule 5.100.
- Interconnection working group to revise Rule 5.500
  - Formed in March 2015, led by PSD
  - Included utilities, developers, PSD
  - Informal process, parallel to PSB net metering process
  - Objectives: update 5.500 and combine all interconnection in one rule (bring net metering into 5.500)
  - Work group met 9 times to develop draft
  - Draft filed by PSD with PSB March 18, 2016

Summary of draft — key provisions

- Retains "**cost-causer pays**" as economic tool for optimizing location, i.e., electrically "bad" locations will be more costly to interconnect
- Adds **storage** to definition of generation
- **Integrates net metering** into 5.500 — provisions are tied to size instead of regulatory category
- Establishes a utility **queue**
- **System impact studies**: formalizes Vermont standard of assuming other generators are on as they would be expected to operate (versus the ISO-NE "minimum interconnection" standard)
- Incorporates process elements from FERC SGIP 2013 revision: **fast track, supplemental review**
- Incorporate **electronic application**, consistent with implementation of ePSB
- **Removes Appendix A** and incorporates its codes and standards into body of rule

Ride-through

- VELCO and ISO-NE advocated provisions requiring inverter-based generators to ride through voltage and frequency events
  - Industry recognizes need for this change as inverter-based resource serve an increasing portion of load
- Draft did not include mandatory thresholds proposed by ISO-NE
  - Draft simply says whatever is current IEEE 1547 and other applicable standards apply
- Current standard — IEEE 1547a — allows for ride-through but does not mandate ride-through
- FERC revised its SGIA on 7/21/16 to require ride-through, saying high penetration of distributed generation made it essential to address without waiting for full IEEE 1547 revision now underway
  - PSD now proposing to incorporate similar language into Rule 5.500 draft
  - FERC approach relies on “good utility practice” standard
  - California Rule 21 approach contains thresholds (approach advocated by ISO-NE)

From FERC order adopting ride-through language

…the absence of ride through requirements for small generating facilities may have adverse impacts on the reliability of the electric grid. We find that the lack of ride through requirements for small generating facilities is unduly discriminatory. This is due to the increased presence and impact of small generating facilities, including distributed energy resources, on the electric system, that could create reliability issues if they do not have the capability to ride through voltage or frequency disturbances. Further, improvements in technology, such as smart inverters, make it economically feasible for small generating facilities to ride through voltage and frequency disturbances.

FERC Docket No. RM16-8-000; Order No. 828, Requirements for Frequency and Voltage Ride Through Capability of Small Generating Facilities, issued July 21, 2016, pp. 14-15.

New section 1.5.7 of FERC pro forma SGIA

The Interconnection Customer shall ensure “frequency ride through” capability and “voltage ride through” capability of its Small Generating Facility. The Interconnection Customer shall enable these capabilities such that its Small Generating Facility shall not disconnect automatically or instantaneously from the system or equipment of the Transmission Provider and any Affected Systems for a defined under-frequency or over-frequency condition, or an under-voltage or over-voltage condition, as tested pursuant to section 2.1 of this agreement. ***The defined conditions shall be in accordance with Good Utility Practice*** and consistent with any standards and guidelines that are applied to other generating facilities in the Balancing Authority Area on a comparable basis. . . . [emphasis added]

http://www.ferc.gov/whats-new/comm-meet/2016/072116/E-11.pdf

“Good Utility Practice” definition CA PUC Rule 21

Any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region.

CA utilities specify settings in Rule 21 tariffs

SDGE
San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 27317-E
Canceling Revised Cal. P.U.C. Sheet No. 26026-E

RULE 21 Sheet 112

GENERATING FACILITY INTERCONNECTIONS

H. Generating Facility Design and Operating Requirements (Continued)
2. Prevention of Interference (Continued)
f. Frequency (Continued)

Table H.2
Frequency Trip Settings

Frequency Range (Assuming 60Hz Nominal)	Maximum Trip Time *[1]* (Assuming 60 Cycles per Second)
Less than 59.3 Hz	10 Cycles
Greater than 60.5 Hz	10 Cycles
Less than 57.0 Hz	10 Cycles
Less than an adjustable value between 59.8 Hz and 57 Hz but greater than 57 Hz. *[2]*	Adjustable between 10 and 18,000 Cycles. *[2, 3]*
Greater than 60.5 Hz.	10 Cycles

PG&E
Pacific Gas and Electric Company
San Francisco, California
U 39

Cancelling Revised *Cal. P.U.C. Sheet No.*
Revised *Cal. P.U.C. Sheet No.*

ELECTRIC RULE NO. 21 Sheet 16

GENERATING FACILITY INTERCONNECTIONS

H. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

2. PREVENTION OF INTERFERENCE (Cont'd.)

f. Frequency (Cont'd.)

Table H.2
Frequency Trip Settings

Generating Facility Rating	Frequency Range (Assuming 60Hz Nominal)	Maximum Trip Time *[1]* (Assuming 60 Cycles per Second)
Less or equal to 30kW	Less than 59.3 Hz	10 Cycles
	Greater than 60.5 Hz	10 Cycles
Greater than 30 kW	Less than 57.0 Hz	10 Cycles
	Less than an adjustable value between 59.8 Hz and 57 Hz but greater than 57 Hz. *[2]*	Adjustable between 10 and 18,000 Cycles. *[2, 3]*
	Greater than 60.5 Hz.	10 Cycles

Questions for distribution utilities

- FERC SGIA effectively applies only to interconnections at the transmission level
  - What issues does it raise to apply it to distribution level interconnection?
  - What concerns do you have if the rule require ride-through, but leaves thresholds to “good utility practice” to be implemented through application of IEEE 1547a and subsequent 1547 revisions in interconnection agreements?