

Name: PRC-024-WECC-1-CR – Generator Low Voltage Ride-Through Criterion

Criterion Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

Completed Actions	Completion Date
1. Post Draft Standard for initial industry comments	February 20, 2008

Description of Current Draft:

- A. This new Generator LVRT Criterion supersedes the existing WECC LVRT Standard, dated June 17, 2005. However, it does not supersede other existing Regional, National or Industry standards, criteria or guides (for example, Off-Nominal Frequency Standard, Planning Standards, ANSI Standards, IEEE Guides, etc.) that have previously been developed to maintain the reliability of the transmission system or to describe protection requirements for synchronous generators.¹

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Drafting Team to review and respond to initial industry comments	April 8-9, 2008
2. Post Draft Standard for industry comments	April 18, 2008
3. Drafting Team to review and respond to industry comments	May 19, 2008
4. Post Draft Standard for Planning Committee approval	May 28, 2008
5. Planning Committee ballots proposed Criterion	June 25-27, 2008
6. Post Draft Criterion for WECC Board approval	July 1, 2008
7. WECC Board ballots proposed standard	August 13-15, 2008

¹ A white paper, dated June 13, 2007, and entitled, “The Technical Basis for the New WECC Voltage Ride-Through (VRT) Standard” provides technical justification for this criterion. The paper was prepared by the WECC Wind Generation Task Force.

Definitions of Terms Used in Criterion

Definitions

Point of Interconnection (POI):

The POI is the location where the generator tie-line or generation collector system interconnects with the transmission network. This is the location to assess compliance with this Standard.

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A. Introduction

1. **Title:** WECC Generator Low Voltage Ride-Through (LVRT) Criterion
2. **Number:** PRC-024-WECC-1
3. **Purpose:** To ensure that generators will not trip off-line during specified voltage excursions as a result of improper coordination between generator protective relays and generator voltage regulator controls and limit functions (such coordination will include the generating unit's capabilities).
4. **Applicability**
 - 4.1. Generator Owners with generators interconnected at voltage levels that are 60 kV and above.
 - 4.2. Generator Operators with generators interconnected at voltage levels that are 60 kV and above.
 - 4.3. This Criterion does not apply to individual units or to a site where the sum of the installed capabilities of all generators is less than 10 MVA, unless it can be proven that reliability concerns exist.
5. **Effective Date: September 1, 2008**

B. Requirements

The following requirements refer to the LVRT curve shown in Attachment 1 WECC PRC-024-WECC-1 Figure 1, which shows the low voltage boundary during the fault clearing period and the voltage recovery period as measured at the POI.

- WR1.** During the fault clearing period (Figure 1), generators are required to remain in-service during normally cleared system faults (for example, a Zone 1 three phase fault that extends no more than 9 cycles) unless clearing the fault effectively disconnects the generator from the system.
- WR1.1.** The actual clearing time required for a generating plant is specific to the generating plant location. Such clearing time shall be coordinated between the transmission provider and the generator owner/operator.
- WR1.2.** The generators within the generating facility shall not violate the POI voltage Criterion defined in Figure 1. Specifically, if a normally cleared fault results in any generators within the generating facility to trip sympathetically, such a tripping event will be considered in violation of the LVRT Criterion.
- WR1.3.** If there is delayed clearing, the generating plant may disconnect from the transmission system.

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WR.2. During the voltage recovery period (refer to Figure 1), generators are required to remain in-service after a normally-cleared fault provided voltages as measure at the POI are greater than or equal to the voltage-time curve.

WR2.1. Generators are required to remain in-service for the low voltage excursions specified in Attachment 2 WECC PRC-024-WECC-1 Table W-1 as applied to a load bus.

WR.3. Generators may be tripped after fault initiation if this action is intended as part of a special protection system (SPS).

C. Measures

WM1. Generator Owners and Operators shall have evidence that their generators remain in-service during normally cleared system faults unless clearing the fault effectively disconnects the generator from the system.

WM1.1. Generator Owners and Operators shall have evidence that their clearing time for generators have been coordinated with the Transmission Provider.

WM1.2. Generator Owners and Operators shall have evidence that their generating facilities have not violated the POI Voltage Criterion defined in Figure 1.

WM1.3. Generator Owners and Operators shall have evidence that, the generating plant was disconnected from the transmission system due to delayed clearing.

WM2. Generator Owners and Operators shall have evidence that their generators remain in-service after a normally-cleared fault provided voltages as measured at the POI are greater than or equal to the voltage-time curve (Figure 1).

WM3. Generator Owners and Operators shall have evidence that their Generators are tripped after fault initiation as part of a special protection system (SPS).

D. Compliance

WC1. Compliance Monitoring Process

WC1.1. Compliance Monitoring Responsibility

Compliance Enforcement Authority

WC1.2. Compliance Monitoring Period and Reset

Compliance Enforcement Authority may use one or more of the following methods to assess compliance:

- Spot check audits conducted anytime with 30 days notice given to prepare
- Periodic audit as scheduled by the Compliance Enforcement Authority
- Investigations

WC1.2.1. Compliance Monitoring Period: Annual

WC1.2.2. The Performance-reset Period is four years.

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WC1.3. Data Retention

Reliability Coordinators and Balancing Authorities shall keep evidence for Measure WM.1 through WM3 for six years plus current, or since the last audit, whichever is longer.

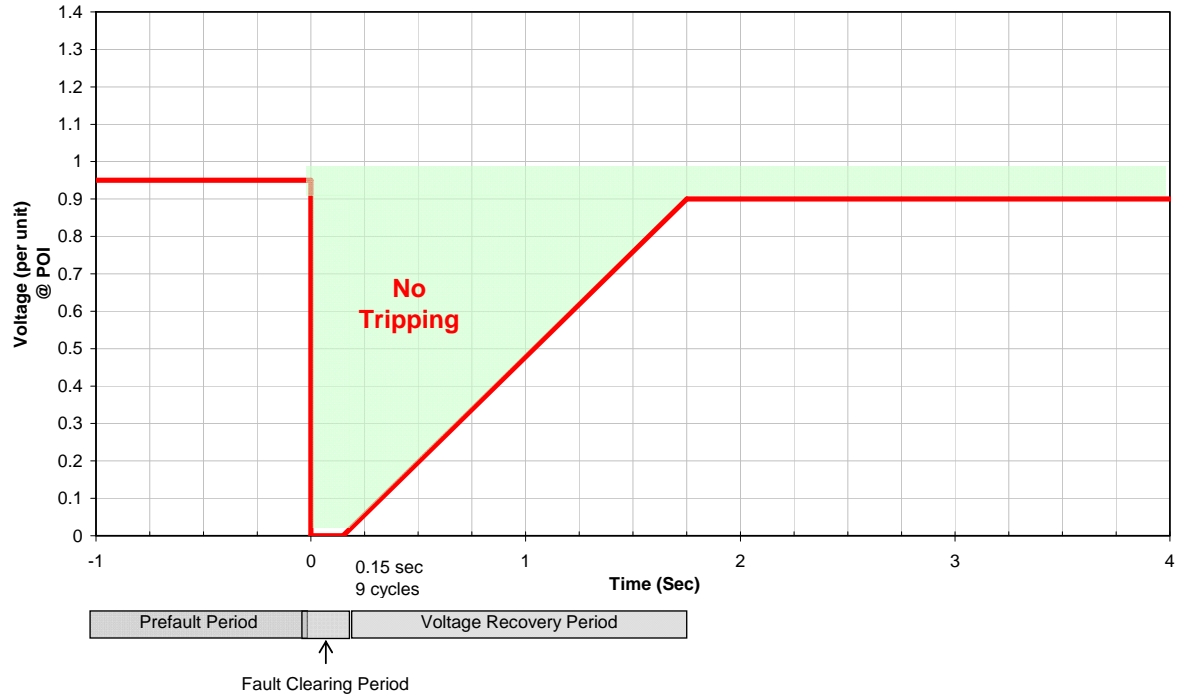
WC1.4. Additional Compliance Information

This Criterion can be met by the performance of the generators or by installing additional equipment (e.g., SVC, etc.) within the generating facility.

Version History – Shows Approval History and Summary of Changes in the Action Field

Version	Date	Action	Change Tracking
1	September 1, 2008	Permanent Replacement Criterion for LVRT Criterion approved June 17, 2005.	1

Attachment 1 WECC PRC-024-WECC-1
Figure 1
WECC Generator Low Voltage Ride-Through Criterion



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**Attachment 2 WECC PRC-024-WECC-1
WECC DISTURBANCE-PERFORMANCE TABLE
OF ALLOWABLE EFFECTS ON OTHER SYSTEMS**

NERC and WECC Categories	Outage Frequency Associated with the Performance Category (outage/year)	Transient Voltage Dip Standard	Minimum Transient Frequency Standard	Post Transient Voltage Deviation Standard (See Note 2)
A	Not Applicable	Nothing in addition to NERC		
B	≥ 0.33	<p>Not to exceed 25% at load buses or 30% at non-load buses.</p> <p>Not to exceed 20% for more than 20 cycles at load buses.</p>	Not below 59.6 Hz for 6 cycles or more at a load bus.	Not to exceed 5% at any bus.
C	0.033 – 0.33	<p>Not to exceed 30% at any bus.</p> <p>Not to exceed 20% for more than 40 cycles at load buses.</p>	Not below 59.0 Hz for 6 cycles or more at a load bus.	Not to exceed 10% at any bus.
D	< 0.033	Nothing in addition to NERC		

Notes:

- The WECC Disturbance-Performance Table applies equally to either a system with all elements in service, or a system with one element removed and the system adjusted.*
- As an example in applying the WECC Disturbance-Performance Table, a Category B disturbance in one system shall not cause a transient voltage dip in another system that is greater than 20% for more than 20 cycles at load buses, or exceed 25% at load buses or 30% at non-load buses at any time other than during the fault.*

Table W-1