As mentioned at the NPGRTF meeting, the NPGRTF reviewed the possible

conflicting language in Protocols and Operating Guides regarding voltage profiles.

Some, but not all, of the applicable Protocol and Guide sections are mentioned below.

**It is the task force’s recommendation to have OWG review the concerns raised by Texas RE below and report back their findings to ROS for possible further direction.**

Language in the Protocols indicates real -time data for reliability purposes must be accurate within

3% percent. Language in the Operating Guides indicates voltage is to be maintained within 2% of the voltage profile. These requirements appear to conflict with each other, even though by the hierarchal process, the Protocols supersede the Operating Guides in this case. Additionally, language in ERCOT’s Steady State Voltage Control Procedure states that transmission voltage should not exceed 105% nor fall below 95% of the nominal voltage during normal operation of the system and that transmission voltage during emergencies (including contingency events) should

not exceed equipment over excitation ratings.

Texas RE concerns and questions are:

1) What procedure do most entities use to manage voltage? Does this procedure consider the accuracy tolerances of measuring equipment and the possibility of exceeding the equipment ratings?

2) Does the ERCOT process for determining the voltage profile allow for the possibility that the voltage will exceed equipment ratings? (e.g. The voltage profile point is set between the +/ -5% equipment rating, but the +/ -2% (or 3%) tolerance allows it to extend beyond

the 5%).

The maximum operating voltage I typically see for 138kV and 345kV equipment is 145kV and

362kV, respectively. The voltage profile information available in the MIS from previous seasons indicates there are over 100 generators with voltage profile setpoints above 355kV and over 240 generators with voltage profile setpoints above 142kV. A +/- 3% band at 355kV could extend the actual voltage as high as 365kV, which is above the maximum equipment rating. Similarly, a +/- 3% band at 142kV could extend the actual voltage as high as 146kV.

Applicable Protocols and Guides

Nodal Protocol 6.5.5.2(8): Real-Time data for reliability purposes must be accurate to within three

percent. Nodal Operating Guide 2.7.2(b)(i): Entities must coordinate high voltage limits in order to

guarantee that the maximum continuous over-voltage of equipment is not exceeded. Transmission

Operators (TO) shall notify ERCOT of normal operating voltage limits and post-contingency voltage

limits for each bus;

Nodal Operating Guide 2.7.4.1(4): Except under Force Majeure conditions or ERCOT-permitted

operation of the Generation Resource, if a Generation Resource required to provide VSS fails to maintain transmission system voltage at the point of interconnection with the TSP within 2% of the voltage profile while operating at less than the maximum reactive capability of the Generation

Resource, ERCOT may, at its discretion, report this to the Texas RE.

ERCOT Steady State Voltage Control Procedure: Voltage Limits

(1) Transmission voltage should not exceed 105% nor fall below 95% of the nominal voltage during normal operation of the system.

(2) Transmission voltage during emergencies (including contingency events) should not exceed equipment over excitation ratings.

(4) Transmission voltage post contingency should neither fall below 90% nor exceed 110% of the per-unit voltage. If there is a more conservative limit on the high side than 110% than,

the conservative limit shall not be exceeded.

Nodal Protocol 6.5.7.1.10(1): Using the input provided by the State Estimator, ERCOT shall use the

NSA processor to perform analysis of all contingencies remaining in the active list. For each contingency, ERCOT shall use the NSA processor to monitor the elements for limit violations. ERCOT shall use the NSA processor to verify Electrical Bus voltage limits to be within a percentage tolerance as outlined in the ERCOT Operating Guides. Contingency security violations for transmission lines and transformers occur if:

(a) The predicted post-contingency MVA exceeds 100% of the Emergency Rating after adjustments for Real-Time weather conditions applicable to the contingency are

incorporated; and”……..

Nodal Protocol 3.15(1): ERCOT in coordination with the Transmission Service Providers (TSPs) shall

establish and update, as necessary, the ERCOT System Voltage Profile for all Electrical Buses used for Voltage Support in the ERCOT System and shall post all Voltage Profiles on the Market Information System (MIS) Secure Area. ERCOT may temporarily modify its requirements based on current system conditions. (2) All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than 20 MVA or those units connected at the same

Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than

20 MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service

(VSS).

David Penney, P.E.

Sr Reliability Engineer

Texas Reliability Entity, Inc.