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## Attachment H - Voltage SOL Identification Procedure

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## I. Voltage SOL Identification Procedure


This Procedure presents the general philosophy/method for identifying and resolving steady-state voltage limit exceedances and determining if a voltage limit exceedance is a System Operating Limit (SOL). All first contingency (N-1) voltage limit exceedances, as indicated in Contingency Analysis (CA), should be treated as potential voltage SOL exceedances. When Real-Time voltage is greater than the highest voltage limit, the condition will be considered an SOL violation. When Real-Time voltage is below the lowest voltage limit, the condition will be considered either an SOL or Interconnection Reliability Operating Limit (IROL) exceedance or violation, based on the assessment in the following step 3.B.

This function is executed while monitoring system voltage performance. Use Figure 1 below for the summary of actions to be taken. Each action is described in detail after Figure 1.

**Figure 1**


Action Summary for Voltage Exceedance/Violation Identification/Resolution
1. Identify voltage limit exceedance/violation
2. Operator confirmation of steady-state voltage limit exceedance/violation
3. Confirm a voltage limit exceedance/violation with applicable Transmission Operators (TOPs), if needed
4. Resolve the voltage limit exceedance/violation
5. If voltage limit exceedance <b>cannot</b> be resolved, the applicable Local Control Center (LCC)/Transmission Owner (TO) accepts the exceedance and develops an action plan

1. Identify the voltage limit exceedance
  - A. ISO New England (ISO) or an LCC can identify the exceedance.
  - B. The exceedance can either be pre- or post-contingent identified either through supervisory control and data acquisition (SCADA) alarms or CA.
2. Operator confirmation of the steady-state voltage limit exceedance
  - A. Confirmation may include:
    - (1) Separate analysis with off-line tools and/or validation of key SCADA data (i.e. voltage readings, unit / automatic voltage regulator (AVR) / capacitor / reactor status).
      - a. Any voltage exceedance persisting for two minutes or less is **not** a steady-state

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voltage exceedance and warrants **no** further review

- (2) In Real-Time, determine accuracy of the voltage indication at the station. Factors to consider are:
  - a. M/LCC15 Attachment I - Primary and Secondary Voltage Inter-Control Center Communications Protocol (ICCP) IDs (MLCC15I), if the station is listed
  - b. Voltage readings for other meters at the station
  - c. Voltage estimated at the station from the State Estimator (SE) solution
  - d. Voltage at nearby stations
3. Confirm the voltage limit exceedance with other appropriate TOPs (if needed)
  - A. If unable to confirm between operators, then the voltage results provided by the more accurate / complete system model local to the exceedance can be accepted if both operators agree. If the operators are unable to agree or both operators identify a voltage limit exceedance, use the more conservative result.
  - B. If the voltage limit exceedance is confirmed, the ISO and LCC operators must discuss and agree on the following:
    - (1) The start time of the voltage limit exceedance
    - (2) Make an initial SOL / IROL determination to apply the appropriate timer (120 or 30 minutes) for the voltage limit exceedance
      - a. A high voltage limit exceedance is an SOL
      - b. A low voltage limit exceedance is:
        - Treated as an IROL, when voltage on two or more non-radial 345 kV stations is below 95% of nominal voltage (328 kV); or
        - Treated as an IROL when transmission stations serving 500 MW or more net load have post-contingent voltage at or below 95% of nominal voltage on the 345 kV system, or less than 90% of nominal voltage on the 230 or 115kV systems; or
        - Treated as an SOL for any other low voltage limit exceedance
    - (3) Determine what pre- and post-contingent actions are needed to resolve this exceedance
    - (4) Determine if any enhanced voltage limits are needed to allow the use of post-contingent actions (for SOLs only)
    - (5) Contact the ISO on-call engineer to obtain confirmation or correction to any low voltage IROL identification

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#### 4. Resolve the voltage limit exceedance

- A. If pre-contingent NORMAL and EMERGENCY actions resolve the exceedance, the operators will agree upon a course of action and implementation that is effective within the appropriate time period. If post-contingent actions are required, an enhanced voltage limit may be needed to allow use of the post-contingent actions. The pre- and post-contingent actions taken to resolve the voltage limit exceedance are the action plan.
- B. Any high voltage exceedance that can be mitigated in less than five minutes at 107% or less of nominal voltage (where the high limit is 105% of nominal), will **not** be considered a high voltage SOL exceedance.
- C. Radial Low Voltage: Radial transmission stations or stations that become radial due to contingencies with voltages below the low voltage limits will **not** be considered SOLs.
- D. Radial High Voltage: A radial exception may also be applicable for voltages above the high voltage limit for:
  - (1) Radials involving TO only elements. The LCC for that TO only radial can provide the exception. If the high voltage condition exceeds 115% of nominal, the exception must specify both the new high limit and the allowed time duration. This radial high voltage exception is to be used for Real-Time conditions or Real-Time CA (RTCA) only, and **cannot** be applied to operations planning study results. The only voltage criteria exceptions that can be applied to operations planning studies are those which are:
    - documented in MLCC15 Attachment E Transmission System Voltage Criteria Exceptions (MLCC15E) *or*
    - documented in the ISO Temporary Guide (TG) “Voltage Criteria Exceptions Temporary” *or*
    - topology driven and receive TO approval as documented in the CROW applications. For example, based on expected system conditions, a contingency shows high voltage on the open ended side of a transformer. However, the other side of the transformer is not experiencing high voltage and the TO either agrees that the open ended node high voltage is acceptable, or that the other end of the transformer can be opened.
  - (2) Radials involving TO and non-TO owned elements, such as a generator step-up transformer (GSU). To be accepted, the exception must be identified and documented in either the ISO Temporary Guide (TG) “Voltage Criteria Exceptions Temporary” or MLCC15E, where the non-TO Asset owner concurrence is documented. “Voltage Criteria Exceptions Temporary” will note the facilities excepted, the new high limit for the subject facilities, and the allowed time duration. These types of exceptions **cannot** be identified and used in Real-Time conditions or RTCA; these exceptions must already be identified and documented in “Voltage

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Criteria Exceptions Temporary” or MLCC15E before the exceedance occurs.

5. If the voltage limit exceedance **cannot** be resolved with NORMAL actions, perform the following:
  - A. If confirmed as an SOL, the LCC must report the voltage exceedance to ISO.
  - B. For any low voltage limit exceedance meeting the following criteria, ISO Control Room staff shall perform the following actions:
    - (1) Contact the ISO on-call engineer if there is a concern for voltage collapse
      - a. The on-call engineer or Control Room System Operator can determine the potential for voltage collapse using the following guidelines
        - (i) Voltages at or below 85% of nominal indicate potential voltage collapse and will be treated as though voltage collapse at each station experiencing voltage of 85% of nominal or less will occur. This means all transmission lines connected to the station should be expected to open once voltage drops to this level
        - (ii) Determine if voltage collapse is possible given current operating conditions and the limiting contingency (or contingencies) for voltages above 85% of nominal.
        - (iii) Apply the following guidelines for voltage collapse evaluation:
          - (a) Voltages between 90% and 95% of nominal are acceptable and are **not** likely to lead to voltage collapse.
          - (b) Voltages between 85% and 90% of nominal indicate some potential for voltage collapse. The engineer accounts for system weakness which may make the area susceptible to voltage collapse at voltages within this band. If there is any question, err on the side of conservatism and assume voltage collapse will occur.
    - (2) ISO informs the LCC of the potential for voltage collapse and will identify if it is a voltage SOL or IROL exceedance.
6. Any Real-Time operation beyond an SOL, which occurs when operating in any prohibited state (e.g., Drastic Action Voltage Limit-High (DAVL-H), Drastic Action Voltage Limit-Low (DAVL-L)), in any of the voltage tables below, constitutes an SOL exceedance and will be considered an SOL violation until completion of the root cause investigation. A technical review of the facts will be conducted prior to the determination that an SOL exceedance or violation has occurred and a root cause analysis is needed. For potential SOL low voltage and IROL violations, such determinations are made by ISO engineering staff in Operations Support Services in cooperation with the appropriate LCC staff. LCC staff, with the appropriate TOs, would lead the determinations for potential SOL high voltage violations.

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## II. Table Use Example

The proper use of the tables in this document is important for identifying SOLs in Real-Time. Consequently, an example explaining use of the tables is included below.

The following definitions apply globally in the Tables:


- “Condition” is a single word label used in the first column of each Table which contains the system voltage condition under examination.
- “Acceptable” and green color denote an acceptable system voltage condition for which the operator does **not** need to take immediate action to change or alter. Any of the emergency voltage conditions, on the other hand, do require operator action to return the system voltage condition to “Acceptable”.
- An “Action Plan” may include both pre- and post-contingency actions. The “Action Plan” does **not** need to include any pre-contingency actions. The actions included must be able to be performed in the allowed time period for the voltage limit in question.
- The second column label in each Table uses the single word “Voltage” to describe the voltage assessment condition to determine which system voltage condition is the correct choice for the specific voltages (Real-Time and contingency) under examination. The voltage assessment conditions are set-up so that for any given voltage, only one system voltage condition can be true.
- Table Notes that apply globally to the Table are assigned to the Table title. This means that the notes are applicable to all conditions captured in the Table, i.e., each row. In other words, these notes are applicable during all potential operating conditions.

In this example, Table 1 will be used. This table is for 115 kV facilities operated by CONVEX and owned by Eversource. The example will focus on the SOL table. For the purposes of this example, the following voltage information is true:

- A non-radial Eversource 115 kV station has a voltage of 116 kV in Real-Time
- CA shows the same Eversource 115 kV station has identified a potential low voltage condition of 104 kV

For the “Real-Time” voltage, according to Table 1, the 116 kV station voltage has a Condition of “Acceptable” because the voltage falls within the defined upper and lower limits of the Acceptable Condition of 121 and 105 kV, respectively. The lowest contingency voltage determined, however, does **not** fall within the “Acceptable” Condition. This condition does not meet the IROL criteria defined in 3.B.2. above, therefore the lower half of the SOL portion of Table 1 is applicable. For CA, the 104 kV contingency voltage condition is less than 105 kV, but above 102 kV, meaning that the contingency condition is Long Time Emergency Voltage Limit – Low (LTEVL-L). Per the table, the operator has 120 minutes to either take action to mitigate the low voltage condition or develop an Action Plan to resolve the issue post-contingency, per Note 2.



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## LCC Voltage Limit Operator Aid Tables Legend

### Table Key :

Can remain in this state indefinitely

Can remain in this state at least a period of time, and potentially indefinitely if an Action Plan is developed and the pre-contingent portion is executed

Cannot remain in this state - An Action Plan is needed and must be executed to leave this state  
Staying in this state can result in an SOL / IROL exceedance

This state is prohibited - Cannot remain in this state - Must take immediate action to leave this state for an acceptable one – Being in this state may result in an SOL / IROL

### Table Notes:

Note 1 : Voltage Limits and associated timelines may **not** be applicable on radial transmission stations (radial either by design or the result of a contingency). See Section 4.C & 4.D

Note 2 : Presumes an Action Plan will restore voltage to system voltage limits within allowed time durations post-contingency.


Note 3 : An Action Plan to resolve the IROL based upon load shedding is needed to allow operation in this state. Non-load shedding plans are also allowed if effective. All plans must be able to be completed as soon as possible and well within the allowed time period.

Note 4 : All NORMAL actions should be taken to return voltage within the NORMAL Low and High voltage limits shown in OP-19 Transmission Operations, Appendix K Operating Voltage Limits by LCC (OP-19K).

Note 5 : These limits are to be applied after any local protection and automatic control action (i.e., includes but **not** limited to; shunt devices, transformer load tap changer (LTC) step changes, etc.)

Note 6 : Conditions where RTCA indicates voltages > 105% and ≤ 107% per unit (p.u.) may be permitted if they can be mitigated in < five minutes post-contingency; if so, the time allowed in this state is “Indefinite”. This exception may only be invoked in Real-Time.

Note 7 : Voltage Limits and associated timelines may **not** be applicable if determined to not be an IROL per Section 3.B.2.b.

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**Table 1 - CONVEX (ES) - 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b><u>IROLs<sup>1,5,7</sup></u></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	105 to 121	not applicable	Indefinite
LTEVL-L	< 105	Within 15 minutes	15 minutes
STEVL-L	< 102	Within 5 minutes	5 minutes
DAVL-L	< 100	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	105 to 121	not applicable	Indefinite
LTEVL-L	< 105	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 102	Within 30 minutes	30 minutes
DAVL-L	< 100	Within 30 minutes	30 minutes

<b><u>SOLs<sup>1,5</sup></u></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	105 to 121	not applicable	Indefinite
LTEVL-L	< 105	Within 15 minutes	15 minutes
STEVL-L	< 102	Within 5 minutes	5 minutes
DAVL-L	< 100	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	105 to 121	not applicable	Indefinite
LTEVL-L	< 105	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 102	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 100	Within 120 minutes	120 minutes




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**Table 1a - CONVEX (UI) - 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 15 minutes	15 minutes
STEVL-L	< 105	Within 5 minutes	5 minutes
DAVL-L	< 100	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 105	Within 30 minutes	30 minutes
DAVL-L	< 100	Within 30 minutes	30 minutes


  

<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 15 minutes	15 minutes
STEVL-L	< 105	Within 5 minutes	5 minutes
DAVL-L	< 100	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 105	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 100	Within 120 minutes	120 minutes

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**Table 2 - CONVEX - 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Within 120 minutes	120 minutes


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**Table 3 - Maine (CMP) 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	NOT AN IROL – go to SOL table	
LTEVL-H	> 122	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
DAVL-L	< 105.8	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	NOT AN IROL - go to SOL table	
LTEVL-H	> 122	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes <sup>3</sup>
DAVL-L	< 105.8	Within 30 minutes	30 minutes


  

<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	Take immediate action	No time allowed / potential SOL violation
LTEVL-H	> 122	Within 30 minutes	30 minutes
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
DAVL-L	< 105.8	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	Within 120 minutes	120 minutes
LTEVL-L	> 122	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 105.8	Within 120 minutes	120 minutes

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**Table 3a - Maine (Versant Power) 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	NOT AN IROL – go to SOL table	
LTEVL-H	> 122	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
DAVL-L	< 105.8	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	NOT AN IROL - go to SOL table	
LTEVL-H	> 122	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes <sup>3</sup>
DAVL-L	< 105.8	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	Take immediate action	No time allowed / potential SOL violation
LTEVL-H	> 122	Within 30 minutes	30 minutes
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
DAVL-L	< 105.8	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Limit	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 124	Within 120 minutes	120 minutes
LTEVL-H	> 122	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	109.3 to 122	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 105.8	Within 120 minutes	120 minutes


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**Table 4 - Maine 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	NOT AN IROL – go to SOL table	
STEVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	NOT AN IROL - go to SOL table	
STEVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Within 30 minutes	30 minutes


<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	Take immediate action	No time allowed / potential SOL violation
STEVL-H	>362	Within 15 minutes	15 minutes
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	Within 120 minutes	120 minutes
STEVL-H	> 362	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Within 120 minutes	120 minutes

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**Table 5 - New Hampshire 115 kV Voltage Limit Operator Aid - IROL & SOL**


<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
DAVL-L	< 107	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes <sup>3</sup>
DAVL-L	< 107	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes	120 minutes
DAVL-L	< 107	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 107	Within 120 minutes	120 minutes



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**Table 6 - New Hampshire 230 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Within 120 minutes	120 minutes

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**Table 7 - New Hampshire 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
DAVL-L	< 327.8	Within 120 minutes	120 minutes

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**Table 8 - NSTAR 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	103.5 to 121	not applicable	Indefinite
LTEVL-L	< 103.5	Within 15 minutes	15 minutes
STEVL-L	< 100	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	103.5 to 121	not applicable	Indefinite
LTEVL-L	< 103.5	Within 30 minutes	30 minutes
STEVL-L	< 100	Within 30 minutes	30 minutes
DAVL-L	< 98	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	103.5 to 121	not applicable	Indefinite
LTEVL-L	< 103.5	Within 15 minutes	15 minutes
STEVL-L	< 100	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	103.5 to 121	not applicable	Indefinite
LTEVL	< 103.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 100	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 98	Within 120 minutes	120 minutes

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**Table 9 - NSTAR 230 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	>241.5	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	>241.5	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	>241.5	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	>241.5	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
DAVL-L	< 218.5	Within 120 minutes	120 minutes

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**Table 10 - NSTAR 345 kV Voltage Limit Operator Aid - IROL & SOL**


<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage(kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
DAVL-L	< 328	Within 120 minutes	120 minutes

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**Table 11 - NGRID 115 kV Voltage Limit Operator Aid- IROL & SOL**


<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes
STEVL-L	< 103.5	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 103.5	Within 30 minutes	30 minutes
DAVL-L	< 98	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes
STEVL-L	< 103.5	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 103.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 98	Within 120 minutes	120 minutes



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**Table 12 - NGRID 230 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 30 minutes	30 minutes
DAVL-L	< 207	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 30 minutes	30 minutes <sup>3</sup>
DAVL-L	< 207	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 30 minutes	30 minutes
DAVL-L	< 207	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 241.5	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 207	Within 120 minutes	120 minutes

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**Table 13 - NGRID 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 310.5	Within 120 minutes	120 minutes

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**Table 14 - RIE 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes
STEVL-L	< 103.5	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 103.5	Within 30 minutes	30 minutes
DAVL-L	< 98	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 30 minutes	30 minutes
STEVL-L	< 103.5	Within 5 minutes	5 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 121	Within 120 minutes	120 minutes <sup>5</sup>
Acceptable <sup>4</sup>	109 to 121	not applicable	Indefinite
LTEVL-L	< 109	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 103.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 98	Within 120 minutes	120 minutes

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**Table 15 - RIE 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL – go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Take immediate action	No time allowed / potential SOL violation <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 30 minutes	30 minutes
DAVL-L	< 310.5	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 362	Within 120 minutes	120 minutes <sup>6</sup>
Acceptable <sup>4</sup>	328 to 362	not applicable	Indefinite
LTEVL-L	< 328	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 310.5	Within 120 minutes	120 minutes


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**Table 16 - VELCO 115 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 123	NOT AN IROL – go to SOL table	
STEVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes
STEVL-L	< 103.5	Within 15 minutes	15 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 123	NOT AN IROL - go to SOL table	
STEVL-H	> 121	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 103.5	Within 30 minutes	30 minutes
DAVL-L	< 98	Within 30 minutes	30 minutes


<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 123	Take immediate action	No time allowed / potential SOL violation
STEVL-H	> 121	Within 15 minutes	15 minutes
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes	120 minutes
STEVL-L	< 103.5	Within 15 minutes	15 minutes
DAVL-L	< 98	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 123	Within 120 minutes	120 minutes
STEVL-H	> 121	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	109.3 to 121	not applicable	Indefinite
LTEVL-L	< 109.3	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 103.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 98	Within 120 minutes	120 minutes

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**Table 17 - VELCO 230 kV Voltage Limit Operator Aid - IROL & SOL**


<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 246.1	NOT AN IROL – go to SOL table	
STEVL-H	>241.5	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 30 minutes	30 minutes
STEVL-L	< 207	Within 15 minutes	15 minutes
DAVL-L	< 195.5	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 246.1	NOT AN IROL - go to SOL table	
STEVL-H	> 241.5	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 30 minutes	30 minutes <sup>3</sup>
STEVL-L	< 207	Within 30 minutes	30 minutes
DAVL-L	< 195.5	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 246.1	Take immediate action	No time allowed / potential SOL violation
STEVL-H	>241.5	Within 15 minutes	15 minutes
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 120 minutes	120 minutes
STEVL-L	< 207	Within 15 minutes	15 minutes
DAVL-L	< 195.5	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 246.1	Within 120 minutes	120 minutes
STEVL-H	> 241.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	218.5 to 241.5	not applicable	Indefinite
LTEVL-L	< 218.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 207	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 195.5	Within 120 minutes	120 minutes



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**Table 18 - VELCO 345 kV Voltage Limit Operator Aid - IROL & SOL**

<b>IROLs<sup>1,5,7</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	NOT AN IROL – go to SOL table	
STEVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
LTEVL-L	< 327.8	Within 30 minutes	30 minutes
STEVL-L	< 310.5	Within 15 minutes	15 minutes
DAVL-L	< 293.3	Take immediate action	No time allowed / potential IROL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	NOT AN IROL - go to SOL table	
STEVL-H	> 362	NOT AN IROL - go to SOL table	
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
LTEVL-L	< 327.8	Within 30 minutes	30 minutes
STEVL-L	< 310.5	Within 30 minutes	30 minutes
DAVL-L	< 293.3	Within 30 minutes	30 minutes
<b>SOLs<sup>1,5</sup></b>			
<b>Real-Time</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	Take immediate action	No time allowed / potential SOL violation
STEVL-H	> 362	Within 15 minutes	15 minutes
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
LTEVL-L	< 327.8	Within 120 minutes	120 minutes
STEVL-L	< 310.5	Within 15 minutes	15 minutes
DAVL-L	< 293.3	Take immediate action	No time allowed / potential SOL violation
<b>Contingency Analysis (CA)</b>			
Condition	Voltage (kV)	When Action Plan Needed	Time Allowed in This State (with Action Plan)
DAVL-H	> 369	Within 120 minutes	120 minutes
STEVL-H	> 362	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
Acceptable <sup>4</sup>	327.8 to 362	not applicable	Indefinite
LTEVL-L	< 327.8	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
STEVL-L	< 310.5	Within 120 minutes <sup>2</sup>	Indefinite <sup>2</sup>
DAVL-L	< 293.3	Within 120 minutes	120 minutes

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## M/LCC 15 Attachment H Revision History

Rev. No.	Date	Reason
Rev 0	06/15/15	Initial draft
Rev 1	06/08/16	Annual review by procedure owner; Major changes made to the headings and added the key to each document table;
Rev 1.1	06/22/16	This Minor Revision corrected typos (i.e., data omitted in last change) on page 7 in Table 1 - CONVEX (ES) - 115 kV Voltage Limit Operator Aid – SOL, added DAV-L Voltage (kV) value of "< 100" and added the table second sub-title of "Contingency Analysis (CA)";
Rev 1.2	10/14/16	This Minor Revision corrected typos; on page 27 in Table 9-NSTAR 230kV Voltage Limit Operator Aid - SOL and on page 29 in Table 10 - NSTAR 345kV Voltage Limit Operator Aid - SOL, corrected Contingency Analysis LTEVL-L limits ,made all text in LTEVL-L uniform black; Made administrative changes required to publish a new Minor Revision (added required corporate document identity to all page footers);
Rev 1.3	05/09/17	Periodic review performed requiring no changes;
Rev 1.4	4/19/18	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision;
Rev 2	10/04/18	Annual review by procedure owner; Globally made format changes to make document more useful to operators to identify voltage SOL exceedances; Made applicable data changes due to root cause analyses for high and low voltage exceedances;
Rev 3	01/04/19	Section I, revised limits to note they are for steady state (i.e., not for transient events) and to improve the language for radial exception use; Tables 5, 6 and 7: deleted STEVL-H limit for both Real Time and Contingency Analysis criteria and reverted all Real Time and Contingency Analysis DAVL-H limits to 1.05 p.u. of nominal (121kV, 241.5kV, 362kV);
Rev 4	04/08/19	Added new section 1.4.C to clarify criteria used to determine voltage SOLs; added Note 6 to Table Legend
Rev 5	08/27/19	Annual review by procedure owner; In all headers, replaced document owner "Director, Operations Support Services" with "Manager, Real-Time Studies"; Section I.4, switched sequence of sub-steps B and C (a clarification requested by Operations); Modified NSTAR Tables 8, 9 and 10 to reconcile with OP-19K criteria;
Rev 5.1	05/14/20	Corrected typo in LCC Voltage Limit Operator Aid Table Note 1; changed Section attribution from "4B" to "4C"
Rev 5.2	07/31/20	Annual review completed by procedure owner; no intent changes required. Performed minor edits required to publish document including global name change of Emera to Versant Power.
Rev 6	09/15/20	Table 3A- Versant Power: modified 115kV Acceptable and LTEVL-L limits
Rev 7	07/06/21	Annual review by procedure owner; Section I.3.B.2.b – reconciled IROL low voltage criteria to be consistent with other MLCC15 documents
Rev 8	06/30/22	Annual review performed by the document owner; Clarified in Section I.4.D. that radial high voltage exceptions cannot be used for operations planning studies; Made additional clarifications in Section I.4.D. about radial high voltage exceptions; Added definitions in Section II.

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Rev. No.	Date	Reason
Rev 8.1	01/26/23	Annual review performed by procedure owner requiring no intent changes; Changes to account for Rhode Island Energy (RIE) becoming a Transmission Owner; Minor grammar changes; Made administrative changes required to publish a Minor Revision.
Rev 9	09/14/23	Expedited change to correct time requirement for Real-Time IROL and SOL STEVL-L in Table 11.
Rev 10	02/06/24	Added Tables 14 & 15 for RIE; Added Note 7 to the LCC Voltage Limit Operator Aid Tables Legend and to all IROL Tables 1-18; Modified NSTAR Tables 8, 9 and 10 to reconcile with OP-19K criteria.