NATF CIP 014-2 Requirement R1 Guideline

Disclaimer

Document Intent

The intent of this document is to provide a general guideline to be used for the risk assessment identified in Requirement R1 of CIP-014-2 "Physical Security." It is recognized that individual Transmission Owners may use alternative and/or more specific criteria that they may deem more appropriate for their transmission systems.

Revisions

Date	Version	Notes
01/19/2015	2015-1	Original Version
03/02/2017	2017-1	All references to "CIP-014-1" changed to "CIP-014-2"

Purpose of CIP-014-2 as Defined in the Standard

To identify and protect Transmission stations and Transmission substations, and their associated primary control centers, that if rendered inoperable or damaged as a result of a physical attack could result in instability, uncontrolled separation, or Cascading within an Interconnection.

Requirement R1 of the Standard

"Each Transmission Owner shall perform an initial risk assessment and subsequent risk assessments of its Transmission station and Transmission substations (existing and planned to be in service within 24 months) that meet the criteria specified in Applicability Section 4.1.1. The initial and subsequent risk assessments shall consist of a transmission analysis or transmission analyses designed to identify the Transmission station(s) and Transmission substation(s) that if rendered inoperable or damaged could result in instability, uncontrolled separation, or Cascading within an Interconnection."

Guideline to Perform Transmission Risk Assessment

1. **Step One:** The Transmission Owner identifies stations to be analyzed based on applicability criteria 4.1.1.
    - Note 1: Stations are both existing stations as well as those planned to be in service within 24 months.
    - Note 2: The Facilities described in Applicability Section 4.1.1.1 through 4.1.1.4 are the same as those Transmission Facilities that meet the bright line criteria 2.4 through 2.7 for "Medium Impact" Transmission Facilities under Attachment 1 of Reliability Standard CIP-002-5.1
    - Note 3: In performing this analysis, the general approach is to take out one station at a time, not a combination of stations. A Transmission Owner may determine it is appropriate to take out more than one station at a time, as a result of two or more stations being in close proximity to one another. An example of the type of factors to consider, when considering close proximity, is where proximity is defined as having two (or more) substations situated such that there is either (i) an easy line-of-sight between all of the substation yards from a single site, (ii) an easy access from a common public roadway that exists between all of the substation yards, or (iii) the substation yards are in close enough proximity that a single event can impact both substations (e.g., the debris field from a reasonable incendiary device set off at one yard will impact the other yard). If such conditions exist, consider grouping these substations together before proceeding and treat them as a single substation when performing the next step.
2. **Step Two:** The Transmission Owner identifies cases/system conditions to be analyzed. Cases/system conditions should represent stressful system conditions on the transmission system based on the engineering knowledge and judgment of the planner performing the actual studies for that Transmission Owner's system. Possible items for consideration are:
    - summer peak vs. winter peak load levels
    - shoulder peak load levels with system transfers
    - alternative generation dispatch assumptions

   - alternative load models (i.e., different penetration of inductive load)

3. **Step Three:** The Transmission Owner defines the nature of the initiating event and how it will be modeled in the transmission assessment. Possible items for consideration are:
   - an event that evolves over several minutes allowing time for system operator intervention
   - an effectively instantaneous event involving an explosive or other incendiary device that would result in a fault in the station under attack, which would result in the operation of protective relays to remove the station under attack from the system

4. **Step Four:** The Transmission Owner is responsible for the development of criteria/proxies for instability, uncontrolled separation or Cascading, based on the engineering knowledge and judgment of its system. In developing the criteria for the CIP-014-2 R1 assessment, the following can be considered:
   - applicable regional guidelines, if any
   - post-contingency overload percentage, above applicable ratings, for the Transmission Owner's utility/region
   - post-contingency voltages or voltage deviation
   - amount of load loss
   - amount of generation loss, including those generating units lost due to instability
   - if stability simulations are performed, the following can be considered:
     - the transient voltage response, which includes both the magnitude and duration of voltage excursion
     - negatively damped oscillations/poorly damped or undamped oscillations
     - tripping of lines because of apparent impedance
     - frequency excursions

5. **Step Five:** The Transmission Owner performs appropriate steady-state power flow and/or stability analysis. As the Transmission Owner develops its specific process for performing steady-state and/or stability analysis, the Transmission Owner may consider incorporating the following concepts:
   - Steady-state power flow analysis
     - In performing the steady-state power flow analysis, consider an outage of the entire station as identified in step one and examine the immediate response of the power system to the loss of that substation. That is, all buses in a physically contiguous station are isolated from the transmission system remotely by opening corresponding breakers according to an actual breaker diagram. Upon utility discretion, events at stations, already identified under other planning studies that do not follow this assumption but cause greater impact, can be substituted for assuming all lines into a substation are removed (e.g., a situation where loss of part of the station as opposed to the entire station creates a more severe system impact).

    - In performing the steady-state analysis, the Transmission Owner needs to define what sort of “operator action/planner discretion” will be allowed at each step of the analysis, which would result in the elimination/screening out of a station as a CIP-014-2 R1 “critical facility” station. Examples of “operator action/planner discretion” are:
        - When all loading is below Transmission Owner defined acceptable threshold for assuming operator action to mitigate overloads, the station may be screened out. Typical limitations on mitigation measures imposed under TPL standards (such as loss of local load) do not apply.
        - Event cascades but is limited in scope to a defined area of acceptable size (i.e., is determined to not have a critical impact on the operation of the Interconnection).
        - Event cascades but if project(s) (e.g., ancillary equipment upgrade) can and will be quickly initiated to eliminate/mitigate scope of cascading to an area of acceptable size.
    - For simulations where solution convergence is obtained, lines found to overload beyond their acceptable threshold limits (e.g., including protection limits if known) will be taken out of service and a new solution will be attempted. This process will be repeated until either no lines overload past their acceptable threshold limits or the process has been repeated a defined number of times, as determined by the Transmission Owner, and continues to result in lines overloading past their acceptable threshold limits (i.e., Cascading).
    - Bus voltages assessed as defined in Step Four above.
    - Amount of load loss assessed as defined in Step Four above.
    - Amount of generation loss assessed as defined in Step Four above.
    - Analysis should include monitoring of facilities in systems beyond the system in which the station being analyzed is located. For cascading beyond a Transmission Owner area, neighboring Transmission Owners should work together as necessary to determine the extent of the cascading event(s).
    - For simulations where solution convergence is not obtained, the Transmission Owner may want to consider further analysis to determine the cause of the non-convergence.
- Stability analysis (if performed)
    - If performing stability analysis, the analysis needs to consider the following:
        - The nature of the fault in the station(s) being analyzed (e.g., single phase fault, 3-phase fault, etc.).
        - The placement of the fault in the station(s) being analyzed (e.g., fault located on highest voltage bus of station being tested, fault located on all busses in station being tested, etc.).

  - How the fault will be cleared (e.g., normal clearing by breakers in station being analyzed, remote clearing with normal clearing time, remote clearing with time delay due to loss of relay communication channels, etc.).

- Generator rotor angles assessed for potential transient instability issues as defined in Step Four above.

- Oscillation response assessed for negatively damped oscillations/poorly damped or undamped oscillations as defined in Step Four above.

- Transient voltage response (if applicable) assessed per transient voltage criteria as defined in Step Four above.

- Assessment of other stability criteria as defined in Step Four above.

- In assessing the stability analysis results, results should be viewed as stated in both the March 17, 2014, Order (paragraph 6), the July 17, 2014, NOPR (paragraph 25) and the November 20, 2014, Order (paragraph 33) to assess if the loss of the specific Transmission station or Transmission substation qualifies as a "critical facility" where: "A critical facility is one that, if rendered inoperable or damaged, could have a critical impact on the operation of the interconnection through instability, uncontrolled separation or cascading failures on the Bulk-Power System." The instability of a single generator or multiple generators due to the loss of a Transmission station/substation does not necessarily mean that that Transmission station/substation is a "critical facility." Rather, the threshold for "critical facility" is tied to how the loss of the Transmission station/substation impacts the broader Interconnection.