Table B-1

NYSRC Planning Design Criteria: Contingency Events and Performance Requirements[3]

Contingency events, Fault type and Performance requirements to be applied to bulk power system elem ents

Category	Contingency events Simulate the removal of all elements that protection systems, including Special Protection Systems, are expected to automatically disconnect for each event that involves an AC fault.	Fault type (permanent) On the listed elements where applicable	Performance requirements
I **Single Event**	1. *Fault* on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Three-phase *fault* with normal *fault clearing*	i to viii
	2. Opening of any circuit breaker or the loss of the following: a. transmission circuit b. transformer c. shunt devise d. generator e. bus section	No *fault*	
	3. Loss of single pole of a direct current facility	No *fault*	
	4. *Fault* on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground *fault* with failure of a circuit breaker to operate and correct operation of a breaker failure *protection system* and its associated breakers.	i to viii

[3] Table B-1 incorporates Table 1 of NPCC Directory 1, with the following modifications: (1) bolded NPCC glossary terms have been removed, (2) more stringent NYSRC contingency event criteria are shown in bold, and (3) NYSRC glossary terms are shown in italics. NPCC performance criteria at the bottom of Table B-1 is supplemented by more stringent and specific NYSRC performance criteria in Table B-2.

B. Transmission Planning, cont.

Category	Contingency events Simulate the removal of all elements that protection systems, including Special Protection Systems, are expected to automatically disconnect for each event that involves an AC fault.	Fault type (permanent) On the listed elements where applicable	Performance requirements
	5. *Fault* on a circuit breaker	Phase to ground *fault***,** with normal *fault* clearing.	
	6. Simultaneous *fault* on two adjacent transmission circuits on a multiple circuit tower.	Phase to ground *faults* on different phases of each circuit, with normal *fault clearing*.	
	7. Simultaneous permanent loss of both poles of a direct current bipolar facility	Without an ac *fault*.	
	8. The failure of a circuit breaker to operate when initiated by an SPS after a *fault* on the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground *fault*, with normal *fault clearing***.**	
	9. The failure of a circuit breaker to operate when initiated by an SPS after opening of any circuit breaker or the loss of the following: a. transmission circuit b. transformer c. shunt devise d. generator e. bus section f. **loss of any element**	No *fault*	

B. Transmission Planning, cont.

Category	Contingency events Simulate the removal of all elements that protection systems, including Special Protection Systems, are expected to automatically disconnect for each event that involves an AC fault.	Fault type (permanent) On the listed elements where applicable	Performance requirements
II Event(s) after a first loss and after System Adjustment	1. Following the loss of any critical: a. transmission circuit, b. transformer, c. series or shunt compensating device or d. generator e. single pole of a direct current facility and after System Adjustment, Category I Contingencies shall also apply.	Any Category I event as described above.	Performance requirements i to viii apply. Allowable system adjustments that can be made within 30 minutes between outages include: generation and power flows by the use of ten (10) minute operating reserve and, where available, phase angle control and HVDC control.

Performance Requirements for the contingencies defined in Table B-1:

i. Loss of a major portion of the system or unintentional separation of a major portion of the system shall not occur.

ii. Loss of small or radial portions of the system is acceptable provided the performance requirements are not violated for the remaining bulk power system.

iii. Voltages and loadings shall be within applicable limits for the pre-contingency conditions.

iv. Voltages and loadings shall be within applicable emergency limits for post-contingency conditions except for small or radial portions of the system as described in it.

v. The *stability* of the bulk power system shall be maintained during and following the most severe *contingencies***,** with due regard to successful and unsuccessful reclosing except for small or radial portions of the system as described in it.

vi. For each of the contingencies that involve *fault clearing*, *stability* shall be maintained when the simulation is based on *fault clearing* initiated by the **"**system A" *protection group* and also shall be maintained when the simulation is based on *fault clearing* initiated by the **"**system B" *protection group*. When applying this requirement to contingency Event *no 6*, the failure of a *protection group* shall apply only to one circuit at a time. When evaluating contingency Event #4 breaker, failure *protection* is assumed to operate correctly, even if only a single breaker failure *protection* system exists.

vii. Regarding contingency *no **6***, if multiple circuit towers are used only for station entrance and exit purposes and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded. Other similar situations can be excluded on the basis of acceptable risk, provided that the NYSRC Executive Committee specifically accepts each request for exclusion.

viii. Transient voltage response shall be within acceptable limits established by the Planning Coordinator and the Transmission Planner, except for small or radial portions of the system as described in it.

Table B-2
NYSRC Planning Design Criteria: Supplemental Performance Requirements

Type of Assessment	Performance Requirements for Thermal, Voltage and Stability Assessments
Thermal	**Pre-Contingency Assessment** 1. For normal transfers, no transmission facility shall be loaded beyond its normal *rating*. 2. For *emergency* transfers, no transmission facility shall be loaded beyond its *normal rating*. However, a facility may be loaded to the *long-term emergency (LTE) rating* pre-contingency, if the *short-term emergency (STE) rating* is reduced accordingly. **Post-Contingency Assessment** 1. For normal transfers, no facility shall be loaded beyond its *LTE rating* following the most severe of Contingency Events 1 through 9 specified in Table B-1. An underground cable circuit may be loaded to its *STE rating* as following: Loss of *Generation* - provided *ten (10) minute operating reserve* and/or phase angle regulation is available to reduce the loading to its *LTE rating* within fifteen (15) minutes and not cause any other facility to be loaded beyond its *LTE rating*. Loss of Transmission Facilities - provided phase angle regulation is available to reduce the loading to its *LTE rating* within fifteen (15) minutes and not cause any other facility to be loaded beyond its *LTE rating*. For Contingency Events 4, 5, 6, 7, 8, and 9 in Table B-1 that are not confined to the loss of a single *element*, *Transmission Owners* may request permission from the *NYISO* to design the system so that post-contingency flows up to the *STE ratings* on the remaining facilities can occur. This is permissible provided operating measures are available to reduce the loading to its *LTE rating* within fifteen (15) minutes and not cause any other facility to be loaded beyond its *LTE rating*. Design exceptions should be well documented, including *NYISO* comments, and must be approved by the *NYSRC*. 2. For *emergency* transfers, no facility shall be loaded beyond its *STE rating* following the more severe of Contingency Events 1, 2, or3 in Table B-1. The *STE rating* is based on an assumed pre-loading equal to the *normal rating*. Therefore, if the limiting facility is loaded above its *normal rating* pre-contingency, the *STE rating* must be reduced accordingly.
Voltage	*Reactive power* shall be maintained within the *NYS Bulk Power System* in order to maintain voltages within applicable pre-disturbance limits for both normal and *emergency* transfers, consistent with the Reliability Rules and all applicable guidelines and procedures. **Pre-Contingency Assessment** For both normal and *emergency* transfers, no bus voltage shall be below its pre-contingency low *voltage limit* nor be above its pre-contingency high *voltage limit*. **Post-Contingency Assessment**

B. Transmission Planning, cont.

Type of Assessment	Performance Requirements for Thermal, Voltage and Stability Assessments
	No bus voltage shall fall below its post-contingency low *voltage limit* nor rise above its post-contingency high *voltage limit*. For normal transfers, Contingency Events 1 through 9 specified in Table B-1 are applicable. For *emergency* transfers, Contingency Events 1 through 9 specified in Table B-1 are applicable.
Stability	*Stability* of the *NYS Bulk Power System* shall be maintained during and following the most severe of the design criteria contingencies 1 through 9 specified in Table B-1, with due regard to *reclosing*. For each of those design criteria contingencies that involves a *fault*, *stability* shall be maintained when the simulation is based on *fault clearing* initiated by the "system A" *protection group* and also shall be maintained when the simulation is based on *fault clearing* by the "system B" *protection group*. **System Stability** 1. For normal transfers, the *stability* of the *NYS Bulk Power System* shall be maintained during and after the most severe of Contingency Events 1 through 9 specified in Table B-1. The *NYS Bulk Power System* must be stable if the *fault*ed *element* is re-energized by *delayed reclosing* before any manual system adjustment, unless specific alternate procedures are documented. 1. For *emergency* transfers, the *stability* of the *NYS Bulk Power System* shall be maintained during and after the more severe of Contingency Events 1 through 9 specified in Table B-1. The *NYS Bulk Power System* must also be stable if the *fault*ed *element* is re-energized by *delayed reclosing* before any manual system adjustment. *Emergency* transfer levels may require *generation* adjustment before manually *reclosing fault*ed *element*s not equipped with automatic *reclosing* or whose automatic *reclosing* capability has been rendered inoperative. **Generator Unit Stability** With all transmission facilities in service, generator unit *stability* shall be maintained on all facilities not directly involved in clearing the *fault* for Contingency Events 1 through 9 specified in Table B-1.

Table B-3

Extreme Contingency and System Conditi*o*ns, Fault type and Performance Assessments to be applied to Bulk Power System elements[3].

Category	Contingency events Simulate the removal of all elements that protection systems, including Special Protection Systems, are expected to automatically disconnect for each event that involves an AC fault.	Fault type (permanent) and/or condition applied On the listed elements where applicable	Performance to be assessed
Extreme Contingency	1. Loss of the entire capability of a generating station.	No *Fault*	i, ii, iii.
	2. Loss of all transmission circuits emanating from a generating station, switching station, substation or dc terminal.	No *Fault*	
	3. Loss of all transmission circuits on a common right-of-way.	No *Fault*	
	4. *Fault* on of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Three-phase fault with failure of a circuit breaker to operate and correct operation of a breaker failure *protection system* and its associated breakers (with due regard to successful and unsuccessful *reclosing*).	
	5. *Fault* on a circuit breaker	Three-phase fault, with normal *fault clearing*	
	6. Sudden loss of a large load or major load center.	No *Fault*	
	7. The effect of severe power swings arising from disturbances outside the *NYS Bulk Power System.*	*Fault* applied as necessary.	
	8. Failure of a *Special Protection System*, to operate when required following the normal contingencies listed in Table B-1, Category I, Single Event.	As listed in Table B-1, Category I, Single Event.	
	9. The operation or partial operation of a *Special Protection System* for an event or condition for which it was not intended to operate.	No *Fault*	
	10. Sudden loss of fuel delivery system to multiple plants, (e.g. gas pipeline contingencies).	No *Fault.*	
	Contingency events listed in Table 1, Category I, Single Event	Peak load conditions resulting from extreme weather.	i (b, c), ii, iii.

B. Transmission Planning, cont.

Category	Contingency events Simulate the removal of all elements that protection systems, including Special Protection Systems, are expected to automatically disconnect for each event that involves an AC fault.	Fault type (permanent) and/or condition applied On the listed elements where applicable	Performance to be assessed
Extreme System Conditions		Generating unit(s) fuel shortage (e.g. gas supply adequacy or low hydro) under normal weather peak conditions.	i (c), ii, iii

Performance Assessment

i.. Model the following pre-contingency conditions:

a. **the testing shall be conducted at megawatt ("MW") transfers at a level which is expected at least 75% of the time on a *load* flow duration basis, but not to exceed the maximum operating limit for the *interface* being tested. This may be at or near the normal transfer limit for some *interface*s**.

b. load flows chosen for analysis should reflect reasonable power transfer conditions or highly probable dispatch patterns of generation.

c. appropriate load representation (e.g. active and reactive power as a function of voltage) for transient tests and post transient load flows.

ii.. Examine post *contingency* steady state conditions, as well as stability, overload, cascading outages and voltage collapse to obtain an indication of system robustness and determine the extent of any widespread system disturbance

iii. Where assessment concludes there are serious consequences, an evaluation of implementing a change to design or operating practices to address such *contingencie*s shall be conducted.