

Introduction

General Overview

These reliability criteria are used to plan the transmission system of Old Dominion Electric Cooperative (ODEC) and contain the criteria to determine ODEC’s ability to serve future load and operate the system. In addition to load growth, any significant changes to the generation and storage capacity on ODEC’s or neighboring utility systems will be included in any planning activities.

Transmission Criteria

ODEC service facilities are governed by the reliability standards established by the North American Electric Reliability Corporation (NERC), ReliabilityFirst Corporation (RF), SERC Reliability Corporation (SERC), and the PJM Interconnection, LLC (PJM). The exact planning requirements of these regulated institutions can be found on their websites and external publications. ODEC will adhere to any requirements directed by these agencies to meet their established reliability planning criteria.

Remedial Action Schemes

For the purposes of system planning, including interconnection studies, Transmission Operating Procedures and Remedial Action Schemes are considered herein to be contrary to Good Utility Practice under normal and contingency conditions and will not be accepted as long-term solutions.

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1. Thermal Criteria

Category	Load Condition	Thermal Criteria
(P0-P4, P6-P7)	Summer Peak	<ul style="list-style-type: none"> All generation at MFO. The generation capability of Battery Energy Storage Systems (BESS) shall not be considered; however, a BESS' charging capacity shall be considered as an addition to peak load; load for charging from ANEC distribution shall include an additional 4% for transformer and distribution losses. NRBTMG output will be set to zero.
(P0-P4, P6-P7)	Winter Peak	<ul style="list-style-type: none"> Same as Summer Peak EXCEPT all solar generation set to zero output.
(P0-P4, P6-P7)	Peak Loads	<ul style="list-style-type: none"> Per ODEC Planning Assumptions presented to PJM; specifically, "Historical Coincident Peak Loads over the last 5 years" and "PJM Load forecast for DPL zonal coincidental peak load".
(P0-P4, P6-P7)	Light Load	<ul style="list-style-type: none"> 30% of highest peak load, peaking generation set to zero output. For interconnection planning studies, all other generation dispatched for summer peak load, with a sensitivity subsequently performed for peaking generation also dispatched for summer peak load.
(P0-P4, P6-P7)	Non-Retail Behind the Meter Generation (NRBTMG)	<ul style="list-style-type: none"> For planning purposes, ODEC shall use explicit modeling for NRBTMG within its service territory. Summer and Winter PJM 50/50 peak loads shall not be considered as Maximum Generation Emergency conditions, hence NRBTMG shall be off for these conditions. For historical peak load conditions, NRBTMG shall be dispatched identical to each unit's output on the system during the historical peak and as a sensitivity with NRBTMG sites off-line.

2. Voltage Criteria

Category	Voltage Condition	Voltage Criteria, KV	Voltage Criteria, PU	Voltage Criteria, %
(P0-P4, P6-P7)	Normal	69.0	1.00	
(P0-P4, P6-P7)	High	74.0	1.07	
(P0-P4, P6-P7)	Normal Low	65.5	0.95	
(P0-P4, P6-P7)	Emergency Low	65.0	0.94	
(P0-P4, P6-P7)	Max Voltage Drop	6.90		10.0

3. Stability Criteria

Category	Load Condition	Dynamic Voltage Recovery Criteria
(P0-P4, P6-P7)	Summer Peak Winter Peak Peak Loads Light Load Non-Retail Behind the Meter Generation (NRBTMG)	<ul style="list-style-type: none"> To avoid the occurrence of Bus Voltage Dynamic Instability, bus voltages following a fault clearing shall recover to a minimum of 0.7 p.u. after 2.5 seconds to match PJM's criteria. ODEC reserves the right to require tighter limits where system operations are negatively impacted.

4. Flicker Criteria

Category	Voltage Condition	Solar Output From	Solar Output To	Flicker ΔV Criteria, %
(P0-P4, P6-P7)	All Controls Locked	100% MFO	20% MFO	2.5

5. Required Studies

Category ¹	Applicable Criteria	Requirements
P0 N-0	All the Above	No facility shall exceed its normal (continuous) rating.
P1 N-1:	All the Above	For the contingency loss (or scheduled maintenance) of any one facility (line, transformer, generator, or reactive compensation device) no other remaining facility on the system shall exceed its emergency (4 hour) rating.
P2 N-1:	All the Above	For the contingency loss of any one facility (line section, bus section, breaker failure) no other remaining facility on the system shall exceed its emergency (4 hour) rating.
P3 N-1-1:	All the Above	For the contingency loss of any one facility (generator) and the additional loss of another facility, the system shall not exceed its emergency (4 hour) rating.
P4 N-1-1:	All the Above	For the contingency loss of any one facility (line, line section, transformer, generator, or reactive compensation device) and the additional loss of at least one other facility due to a breaker failure condition, the system shall not exceed its emergency (4 hour) rating.
P6 N-1-1:	All the Above	For the contingency loss of any one facility (line, line section, transformer, generator, or reactive compensation device) and the additional loss of another facility, the system shall not exceed its emergency (4 hour) rating.
P7 N-2:	All the Above	For the contingency loss of any two lines on a common structure no other remaining facility on the system shall exceed its emergency (4 hour) rating. This requirement only applies if the ODEC system were to have any non-radial (network) double-circuit transmission structures.
P0-P4, P6-P7	Stability studies, including dynamic voltage recovery, will be studied for Transmission load block additions and Interconnections.	

¹ PJM has [determined](#) that P5 violations fall under the exemption for thermal reliability violations on transmission substation equipment, per Operating Agreement Schedule 6, paragraph 1.5.8(p). As such, P5 violations are not included in this planning criteria or its associated study requirements.

6. Required Studies - Solar, Wind Generation and Transmission Load Interconnection

Categories	Applicable Criteria	Requirements
P0-P4, P6-P7	Flicker	Change in sunlight incidence on solar panels resulting in voltage flicker shall be studied during the interconnection studies for transmission load, each solar plant individually, or any combination of plants.
P0, P1, P3, P4, P6	All the Above	Solar generation contingencies shall include no solar generation running at all (P0), and the additional P3 contingency of losing all solar generation along with any other contingency described (e.g., the loss of any one generator and all solar generation shall be analyzed.)
P0, P1, P3, P4, P6	All the Above	Wind generation contingencies shall include no wind generation running at all (P0), and the additional P3 contingency of losing all wind generation along with any other contingency described (e.g., the loss of any one generator and all wind generation shall be analyzed.)
P0-P4, P6-P7		Stability studies, including dynamic voltage recovery, will be studied for Transmission load block additions and Interconnections

7. Required Studies - Distributed Energy Resources (DER)

Categories	Applicable Criteria	Requirements
P0-P4, P6-P7	All the Above	The amount of power injected shall be limited to the MFO of the DER minus the lightest load condition on the applicable circuit(s), as provided by ANEC. For solar DER, this amount of power shall be computed for daylight hours only. Injection of power will be measured at either the DER's point of interconnection with ANEC, or at the appropriate ANEC distribution bus if such bus appears in PJM's model of the ODEC system. For BESS DER, the generating capability shall be studied separately from its charging power. Charging power will be studied as an addition to that distribution bus's peak load, including an additional 4% for transformer and distribution losses.

8. Configuration Requirements

- a. A radial 69kV transmission line shall feed no more than 10,000 consumers, 50 megawatts (MW) of load, or have more than 700 MW-Miles of exposure, where a MW-Mile equals Peak MW times Radial Line Length. Once a radial 69kV transmission line's loading exceeds any of these thresholds, an additional transmission source will be required. This additional source may be another transmission line from a different bus, or it may be a transmission line sourced from the same bus as the radial line.
- b. Circuit breakers will be installed on all line terminal positions in substations. Project Developer shall be solely responsible for the protection and control of their generation tie line, such protection and control schemes to be approved by ODEC. Circuit switchers or circuit breakers with appropriate controls are acceptable for transformer high side protection of transformers serving only load, provided they meet the interrupting requirements. All new Generator Step Up (GSU) transformer installations shall have a high-side circuit breaker.
- c. Bypassing of protective devices such as circuit breakers and circuit switchers shall not be allowed for maintenance unless the bypass equipment provides adequate protection.
- d. New transmission lines shall have only two terminals.
- e. New interconnection injection points shall use a ring-bus design. Addition of a facility that would result in more than 6 terminals to the ring bus shall instead be installed as a breaker and a half design.

9. Communications Requirements

- a. All new generation facilities will require two paths of relay speed communications for protection and control of the ODEC system, one mode of which must be fiber optic. These communication paths shall extend from the generator location to all terminals or switching locations on the system that, if opened as part of an N-2, N-1-1, or N-1 during maintenance condition, would cause any portion of the ODEC system to separate from the rest of PJM and become an island supplied only by the generator. Specifics of this requirement will be detailed in a Phase 3 PJM or Affected Transmission Owner Facilities Study.
- b. New PJM Regional Transmission Expansion Plan (RTEP) baseline and supplemental projects requiring conductor addition or replacement on ODEC transmission lines will include terminal-to-terminal (e.g., not just in any single line section) replacement of the existing static wire with optical fiber ground wire (OPGW), if OPGW does not already exist at the location.

10. Glossary

ANEC Accomack & Northampton Electric Cooperative, aka A&N Electric Cooperative
 BESS Battery Energy Storage System
 DER Distributed Energy Resources
 kV kilovolt
 MFO Maximum Facility Output
 MW Megawatt
 NERC North American Electric Reliability Corporation
 NRBTMG Non-Retail Behind The Meter Generation
 ODEC Old Dominion Electric Cooperative
 OPGW Optical fiber Ground Wire
 PJM PJM Interconnection, LLC
 RF Reliability First Corporation
 RTEP Regional Transmission Expansion Plan
 SERC SERC Reliability Corporation, aka Southeastern Reliability Corporation

Revision History		
Date	Revision No.	Notes
August 1, 2024	0	Document Creation: Reformats and Replaces Version Post Publicly