

FERC Order 881 and Impact on Planning Procedure 7



Reliability Committee

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Project Title: FERC Order 881

Proposed Effective Date: October 2024

- In order to comply with FERC Order 881, ISO New England requires multiple changes to transmission line ratings methodologies
- This is the first meeting of the Reliability Committee to discuss impacts to [Planning Procedure 7 \(PP7\)](#) – Procedures for Determining and Implementing Transmission Facility Ratings in New England as a result of FERC Order 881



Background

- On December 16, 2021, FERC issued Order No. 881, the Final Rule on [Managing Transmission Line Ratings](#)
- The Final Rule was the result of the November 19, 2020 NOPR examining both Ambient Adjusted Ratings (AARs) and Dynamic Line Ratings (DLRs)
- [Compliance filings](#) were due July 12, 2022; New England's was accepted on [June 15, 2023](#), subject to an [additional filing](#) which was accepted on [December 12, 2023](#)
- Implementation is required by July 12, 2025



Problem Statement

- Planning Procedure No. 7 (PP7) defines how Market Participants calculate ratings for administered equipment
- PP7 is impacted by the requirements within FERC Order 881
- Market Participants that rate transmission lines will need to provide seasonal ratings and AARs to the ISO on those facilities that meet the requirements in the Order
 - AARs will mainly be provided by Transmission Owners



Current Compliance Efforts

- There are currently two parallel efforts:
 - EMS/IT – primarily discussing the means of transferring information between ISO, the Local Control Centers, and Market Participants
 - Development of the Limited Exchange Portal (LEP) to accept and distribute facility ratings which will remove ratings from the NX application
 - This effort is outside of the scope for the PP7 update – separate discussions on this topic are being held with impacted parties
 - Transmission Planning update to PP7 – Procedures for Determining and Implementing Transmission Facility Ratings in New England
 - PP7 provides the general assumptions to be used in the calculation of facility ratings
 - As part of the effort to address additional seasonal ratings and AARs, other assumptions are being reviewed
 - » Potential changes resulting from climate change
 - » Consideration to industry standards and guidelines, such as assumed wind speed and direction
 - The ISO has been meeting with Transmission Owners to discuss PP7 changes
 - PP7 is not required to be used for transmission facilities that provide Local Network Service under Schedule 21
- This presentation will discuss general ratings methodology changes



Order 881 Overview

- The Order requires using Normal, Emergency, and seasonal ratings
 - ISO currently uses Normal and Emergency ratings
 - Expansion of seasonal ratings from 2 to a minimum of 4 seasons is required
- The Order requires that transmission providers take into account the natural cooling and heating effects of weather by implementing Ambient-Adjusted Ratings (AAR) when determining available transmission capacity
- Additionally, the Order introduces several transparency measures that promote and enhance sharing of the Transmission Owner rating methodology and ratings data on password-protected websites



Order 881 Applicability

- The Order is specific to “transmission lines” and therefore, not all elements that are described in PP7 will require an AAR
 - It is up to the Market Participant to determine whether Order 881 applies to their specific equipment
- Order 881 defines “transmission line” rating as the maximum transfer capability of a transmission line, computed in accordance with a written Transmission Line Rating methodology and consistent with Good Utility Practice, considering the technical limitations on conductors and relevant transmission equipment (such as thermal flow limits), as well as technical limitations of the Transmission System (such as system voltage and stability limits).
Relevant transmission equipment may include, but is not limited to, circuit breakers, line traps, and transformers.
- Equipment Owners may, using Good Utility Practice, determine that a specific piece of equipment is not affected by ambient temperature and take an exception on that piece of equipment



Rating Types

- Two types of ratings must be calculated:
 - **Seasonal ratings** – applicable to all transmission equipment
 - The number of seasons could be different in different areas of the country, but the Order requires a minimum of 4 seasons
 - Used in operations in the event that AARs become unavailable, for equipment to which AARs do not apply, and Outage Coordination studies
 - **AARs** – hourly ratings applicable to transmission lines and their associated elements
 - In addition to using appropriate temperatures, the impact of the sun (day vs. night) must also be taken into account
 - AARs are required to be available for temperatures from 10F above the highest historical high temperature to 10F below the lowest historical low temperature
 - Applicable only in Operations timeframe

Seasonal Ratings

- Currently, the ISO uses two seasonal ratings, summer and winter
 - Summer assumes 100F ambient temperatures
 - Winter assumes 50F ambient temperatures
- As previously stated, Order 881 requires at least 4 seasons and each season must reasonably reflect portions of the year where expected high temperatures are relatively consistent
- Based on potential concerns related to IT infrastructure and to ensure consistency of high temperatures within a season, the ISO will be using 12 seasons, one for each month of the year



Seasonal Ratings (cont'd)

- In order to establish the assumed temperature for each of the 12 seasons, a review of historical temperature data was necessary
- To align PP7 with the process used to develop the load forecast, a 15-year period was used evaluate temperatures
 - Weather data from 2007 to 2022 was obtained for the 8* New England regions described in PP7
 - Previous data was from 1975-2004
 - Consistent with the prior study, the 8 New England locations were compared to Hartford and it was deemed that Hartford is similar enough to be representative of the region

*Hartford, Bridgeport, Boston, Worcester, Burlington, Providence, Concord, and Portland



Seasonal Ratings (cont'd)

- In addition to the data needed to support the 12 seasons, two additional datasets are also needed
 - Potentially called “study rating sets” – name has not been finalized
 - These will be utilized for Planning and Operations studies



Additional Ratings – Max AAR Study Rating

- The order requires calculation of AARs down to 10F below the minimum historical temperature
 - Currently, stability testing typically stops once the thermal transfer limit is reached, while accounting for some margin
 - Because line ratings could continue to increase as the temperature drops, the ISO needs to understand how high ratings could go to uncover any stability concerns which may undercut the higher thermal limits
 - Therefore, a Max AAR rating dataset will be needed
 - Max AAR is the maximum AAR rating that will normally be provided when determining AARs

Additional Ratings – 20F

- For summer peak load conditions, the ISO will continue to use 100F data
- However, planning will use rating assumptions for winter peak load cases that are expected to more closely align with the 90/10 winter peak load temperature
 - At colder temperatures, as the temperature drops, load tends to increase
 - This trend is expected to continue with the electrification of heating
 - 90/10 winter peak load is based on an ambient temperature of ~6F
 - Today, peak load is studied using 50F facility ratings
 - Using an additional 20F dataset will allow for ratings more consistent with conditions that drive the load being studied
 - Must ensure that ratings are based on temperatures equal to or above the temperature assumed for 90/10 load
 - Because assessments are based on snapshots of conditions, need to be conservative to ensure that reliability is ensured at warmer temperatures
 - 50/50 winter peak load is based on an ambient temperature of ~11F

Current and Proposed Rating Temperatures – OH Conductor

OH Conductors								
Months	881 Seasons	LTE (hours)	Monthly Maximums (°F) ('07- '22)	Ambient Temperature		Current Season and Temp (°F)	Current Seasons	Current LTE (hours)
				Normal				
				°F	°C			
January	Season 1	4	72	75	24	50	Winter	4
February	Season 2	4	77	80	27			4
March	Season 3	4	83	85	29			4
April	Season 4	4	94	95	35	100	Summer	12
May	Season 5	4	99	100	38			12
June	Season 6	4	99	100	38			12
July	Season 7	4	103	105	41			12
August	Season 8	4	99	100	38			12
September	Season 9	4	96	100	38			12
October	Season 10	4	89	90	32			12
November	Season 11	4	79	80	27	50	Winter	4
December	Season 12	4	69	70	21			4
	Study Case 1	4		20	-7			
	Study Case 2	4		-40	-40			

- The temperature for Normal and Emergency ratings are equal for this equipment

Rational for temperature determination found in PP7 Appendix A General Rating Parameters

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Current and Proposed Rating Temperatures – Transformers

Power and Current Transformer											
Months	881 Seasons	LTE (hours)	Daily Mean with 5°C adder	Ambient Temperature				Average of Monthly Max	Current Season and Temp (°F)	Current Seasons	Current LTE (hours)
				Normal		Emergency					
				°F	°C	°F	°C				
January	Season 1	4	39	40	4	55	13	54	41/50	Winter	4
February	Season 2	4	41	45	7	55	13	53			4
March	Season 3	4	50	50	10	70	21	66			4
April	Season 4	4	62	65	18	80	27	79	77/90	Summer	12
May	Season 5	4	74	75	24	90	32	87			12
June	Season 6	4	83	85	29	95	35	92			12
July	Season 7	4	89	90	32	95	35	94			12
August	Season 8	4	87	90	32	95	35	91			12
September	Season 9	4	79	80	27	90	32	87			12
October	Season 10	4	67	70	21	85	29	81			12
November	Season 11	4	54	55	13	70	21	66	41/50	Winter	4
December	Season 12	4	44	45	7	60	16	57			4
	Study Case 1	4		20	-7	20	-7				
	Study Case 2	4		-40	-40	-40	-40				

Rational for temperature determination found in PP7 Appendix A General Rating Parameters

Current and Proposed Rating Temperatures – Terminal and Other Equipment

Terminal and Other Equipment								
Months	881 Seasons	LTE (hours)	Average of Daily Max temps for Month (°F) ('07-'22)	Ambient Temperature		Current Season and Temp (°F)	Current Seasons	Current LTE (hours)
				Normal*				
				°F	°C			
January	Season 1	4	36	40	4	50	Winter	4
February	Season 2	4	39	40	4			4
March	Season 3	4	48	50	10			4
April	Season 4	4	61	65	18		82	Summer
May	Season 5	4	73	75	24	12		
June	Season 6	4	80	80	27	12		
July	Season 7	4	86	90	32	12		
August	Season 8	4	84	85	29	12		
September	Season 9	4	77	80	27	12		
October	Season 10	4	64	65	18	12		
November	Season 11	4	52	55	13	50	Winter	4
December	Season 12	4	41	45	7			4
	Study Case 1	4		20	-7			
	Study Case 2	4		-40	-40			

- The temperature for Normal and Emergency ratings are equal for this equipment

Rational for temperature determination found in PP7 Appendix A General Rating Parameters

General Ambient-Adjusted Rating Methodology

- Wind speed and direction assumptions will be consistent with seasonal rating methodology
- AARs are required:
 - To be able to be calculated from 10F below the lowest minimum historical temperature to 10F above the maximum historical temperature
 - To reflect, at a minimum, a 5F temperature change
 - To reflect solar heating by having daytime and nighttime ratings
 - Daytime and nighttime will be defined on a monthly basis

Ambient-Adjusted Rating Applicability

- The Order is specific to Transmission Lines and therefore, not all elements that are described in PP7 will require an AAR rating
- The list below shows elements that are impacted by temperature and could require an AAR rating
 - This list was compiled with the help of the Transmission Owners and is consistent with the ISO's understanding of what others are doing around the country
- PP7 will have methodology on how to rate these elements for seasonal ratings and AARs if the equipment owner determines that they require an AAR rating

PP7 Element	Ratings			Day/Night Impact
	Seasonal Only	Seasonal & AAR	Emergency Rating	
OH Conductor		x	x	x
UG Conductor	x		x	
Power Transformer	x	x*	x	
Series/Shunt Reactive Devices	x			
Circuit Breakers		x	x	
Disconnect Switches		x	x	
Current Transformer (CT)		x	x	
Current Transformer (CT)		x	x	
Line Traps		x	x	
Substation Buses		x	x	
CT Circuit Components		x	x	
VAR Compensator	x		x	
HVDC System	x		x	

* Only transformers that are in series with a line

General Ratings Changes

- Presently, the Long-Time Emergency (LTE) Rating rating is 4 hours in the winter and 12 hours in the summer
- The different timing was originally based upon load cycle considerations
 - Summer load would increase steadily throughout the day and decrease overnight, whereas winter had much shorter peak load periods
- Current load shapes have changed such that load cycles are roughly equivalent in summer and winter
- During internal PP7 discussions, the ISO considered whether it would be possible to move all seasonal LTE ratings to a 4-hour rating
 - Topic was discussed with ISO Operations where they were in support of the change
- Based on this review, the ISO plans to move to a 4-hour LTE rating year-round as of the effective date of the Order, July 12, 2025

Further PP7 Changes

- PP7 has not been fully reviewed in nearly ten years
 - Many sections discuss the creation of the planning procedure and how ratings methodology would be done
 - These sections are no longer relevant and will be removed
 - In addition, references to the System Design Task Force need to be removed as that group has not been active for some time
 - References to standards will be updated as some no longer exist



Next Steps

- Redline and clean versions of PP7 main body are included with today's materials
- PP7 appendices/attachments are currently being discussed with the TOs and are expected to be brought to the Reliability Committee as they become available in the next month or two
 - The ISO will seek a vote on the full package of revisions once all documents have been reviewed by the Reliability Committee
- Operating Procedures impacted by Order 881, such as OP-16 and OP-19, will be brought to the RC in approximately Q2 2025

Conclusion

- Order 881 requires updates to PP7 along with OP's that will come at a later date
- Comments on the proposed PP7 revisions or suggested changes can be sent to mdrzewianowski@iso-ne.com by July 31, 2024 to be considered ahead of the August RC



Stakeholder Schedule

Stakeholder Committee and Date	Scheduled Project Milestone
Reliability Committee July 16, 2024	Review of Order 881 and PP7 Conforming Changes
Reliability Committee August 13-14, 2024	Review of PP7 Appendices Review of Stakeholder Comments
Reliability Committee September 17, 2024	Continued Discussion on PP7 and Appendices Possible Vote
Participants Committee October 10, 2024	Vote

Questions

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